

Electrical Construction and Maintenance

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DECEMBER • 1958
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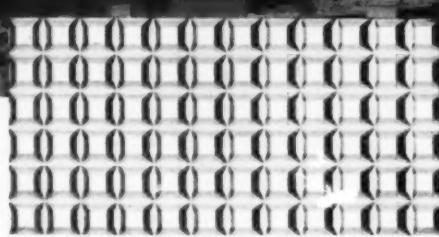
A MCGRAW-HILL
PUBLICATION | 58TH YEAR

Season's
Greetings





**three lamps
with Prismoid-
do more work
than four**



**GUTH PEERLITES® WITH
PRISMOID GRATELITE® LOUVERS
AT McCABE'S, ROCK ISLAND, ILL.**

Engineer: John D. Severance,
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THE EDWIN F. GUTH COMPANY
ST. LOUIS 3, MO.

TRUSTED NAME IN LIGHTING SINCE 1902

*T. M. Reg. U.S. & Can. Pats. Pend.

Originally, this job was laid out for 50 footcandles with Brand X surface fixtures (4 lamp—75 watt).

But McCabe bought suspended Guth Peerlites with Prismoid Louvers, using only three 75-watt lamps.

Result: 40% more light than with the 4-lighters!

And more! The crystal beauty and cheerful atmosphere created by Prismoid flatters the merchandise and puts shoppers in a buying mood.

70 FOOT CANDLES MAINTAINED WITH ONLY
2.5 WATTS PER SQUARE FOOT—THAT'S EFFICIENCY!

Get the complete story of Prismoid efficiency, beauty and breathing action—write us on your letterhead today!

SAFETY SWITCHES STAND UP UNDER 100,000 AMPERE SHORT CIRCUIT TEST!

INDEPENDENT TESTING LAB RELEASES FINDINGS AFTER GRUELING "TORTURE RACK" TESTS

Unprecedented tests have been completed on 30 through 600 ampere rated Square D safety switches equipped with high capacity current limiting fuses. During these tests, switches were closed on a short circuit system delivering up to 100,000 amperes (symmetrical—R.M.S.). In addition, the fault was applied on the closed switches. All switches *were* able to withstand the shocks without any sign of failure!

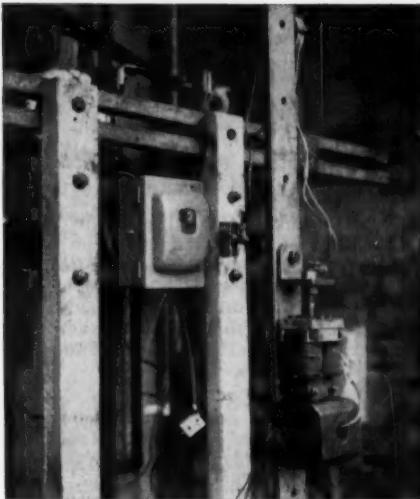
High Capacity Systems Demand Stamina

High capacity systems capable of delivering tremendous short circuits are becoming more and more prevalent with the growth of electrical loads. Network systems in metropolitan areas are a source of

such faults. Another, the heavy industrial areas, with a concentration of sub-stations and rotating machinery. Terrific stresses and heat generated by such faults are serious hazards to both personnel and equipment unless properly contained. That is why proven protection for switching service and feeder circuits is of major concern.

Square D Standard Switches Do The Job

These tests offer conclusive proof that standard Square D Type HD and Type ND switches, equipped with high capacity current limiting fuses, can be used on such systems without fear of failure. You pay no premium for the proven performance they offer. Why settle for less?



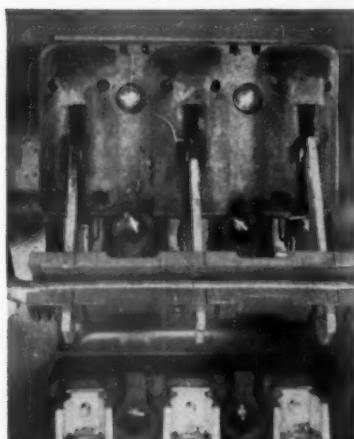
Square D switch on "torture rack" during test involving up to 100,000 ampere short circuit

SUMMARY TABLE • Extract from Report No. S/NA R66—Sheet No. 5

Ampere Rating	Voltage Rating	Catalog Number	Average Symmetrical Prospective Current R.M.S.	Recovery Voltage R.M.S.	Maximum Total Arcing Time	Fuse Type
30	250	A86351	95,600	252	.0009	A2Y-30A
30	250	A86351	95,400	253	.0010	FRN-30A
30	600	A86341	107,000	590	.0020	A6Y-30A
30	600	A86341	106,000	601	.0027	FRS-30A
60	250	A86352	95,400	248	.0010	A2Y-60A
60	250	A86352	95,200	252	.0019	FRN-60A
60	600	A86342	106,000	605	.0011	A6Y-60A
60	600	A86342	108,000	598	.0020	FRS-60A
60	600	A86342	107,000	601	.0013	NAS-60A
100	250	A86353	95,200	253	.0009	A2Y-100A
100	600	A86343	105,000	604	.0014	A6Y-100A
200	250	A86354	95,200	253	.0037	A2Y-200A
200	600	A86344	107,000	602	.0011	A6Y-200A
400	250	A86355	95,900	252	.0039	A2Y-400A
400	600	A86345	106,000	611	.0050	A6Y-400A
600	250	A86356	94,500	251	.0062	A2Y-600A
600	600	A86346	107,000	601	.0062	A6Y-600A

Above • Extract of Nelson High Power Laboratory Report C/NA-66

At left • No sign of failure in this switch interior after 100,000 ampere short circuit test



EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY



APPLETON Industrial Lighting

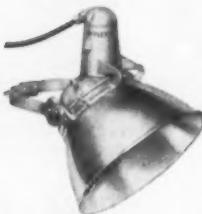
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Rifle Like Aiming

After servicing, just flip lid down and clamp! Due to impregnated asbestos gasket seal, unit is now weatherproof. Exclusive louver ventilation eliminates condensation. Aim by looking through peep-sight, then lock in position . . . horizontal and vertical locking degree calibrations in each unit.



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"EFU"

explosion-proof fluorescent fixtures

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2, 3, and 4-lamp fixtures
... Straight or angle
mounting

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or "Rapid Start" ballasts. Designed
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85, 90, or 100-Watt, 60", T-17 fluo-
rescent lamps. End housings are
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made to a terminal block in the
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required within 18" of arcing devices . . . These
are quality features which give APPLETON
"EFU" Explosion-proof fixtures their continually
growing acceptance in all types of hazardous
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hazardous locations—backed
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experience of APPLETON'S vast
production facilities assures
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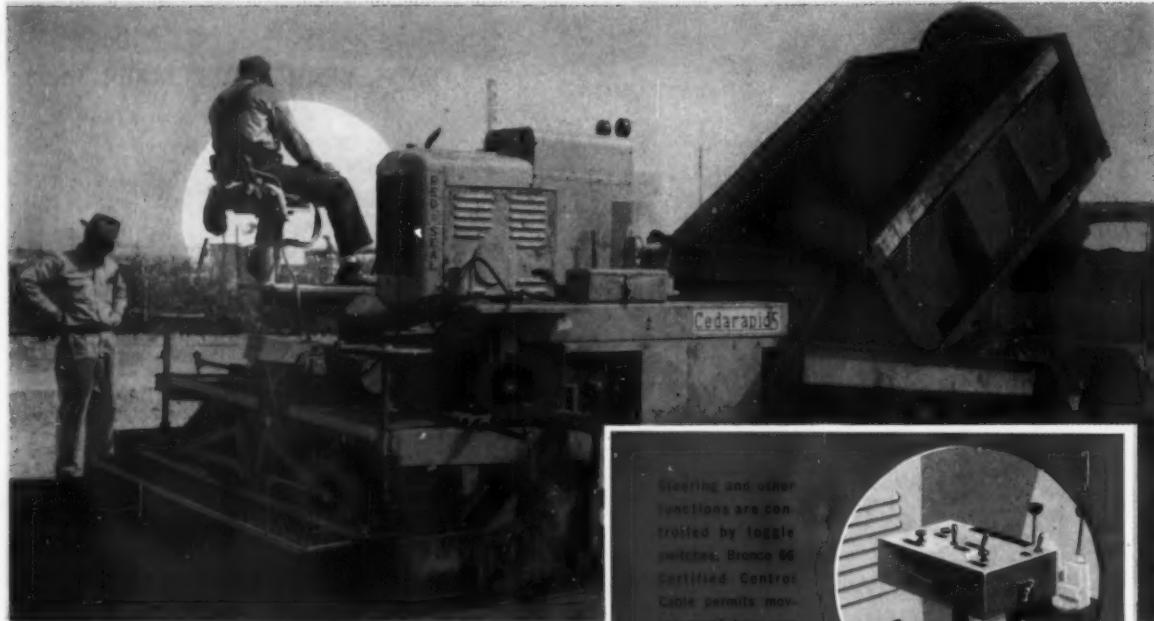
Published for electrical contractors, electrical departments in industry, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

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MORE

Safe, trouble-free performance of electrical bituminous paving machine is aided by Bronco 66 electrical cable



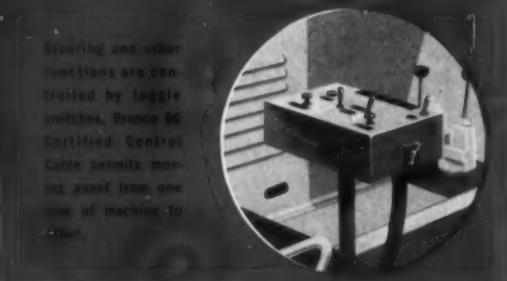
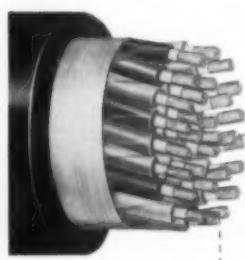
Iowa Manufacturing Company produces the world's finest bituminous paver. It is wired with the world's finest cable, Bronco 66 Certified.

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To take full advantage of the gains brought about by electrification, Cedarapids engineers searched for dependable cable. They chose and guaranteed Bronco 66 Certified for control and power because its outer protecting jacket contains so much more Neoprene. 67.32% DuPont Neoprene gives the cable greater protection from the hot asphalt, from sunlight, ozone, oil, extremes of weather. The Synchro-Cure process of vulcanization gives Bronco 66 Certified the flex-life it must have to stand up under the constant motion of this modern mechanical marvel.

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December 1958

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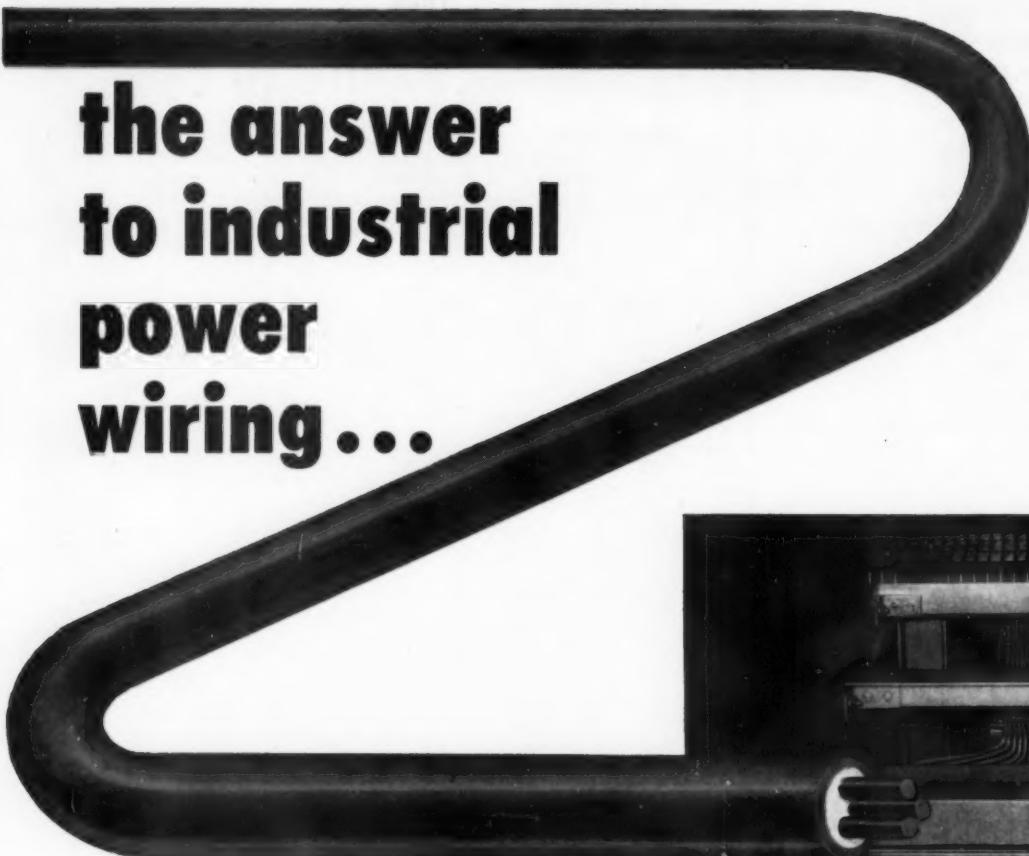
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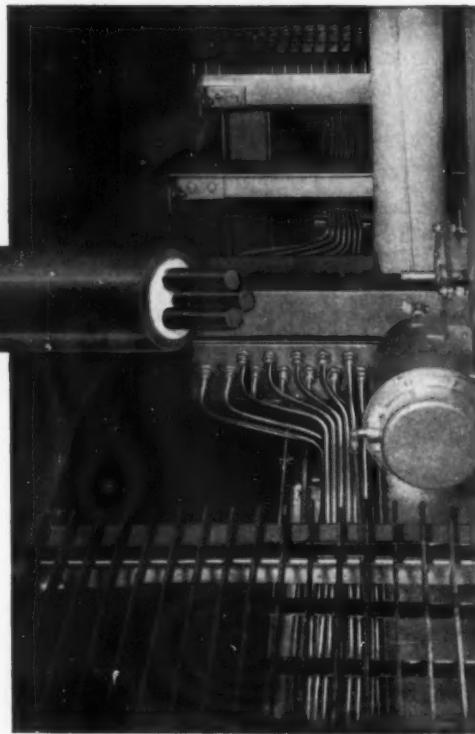
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NECA CONVENTION

The 1958 convention of the National Electrical Contractors Association held in Dallas, Texas, last month attracted an attendance of 2500, a record for NECA and one of the largest electrical industry meetings of all time. The new Dallas Memorial Auditorium provided exceptionally fine facilities for the general meetings and the concurrent electrical trade show. Our editorial staff covered the meetings with camera and notebook, and the activities are described in two articles in this issue; "Dallas Convention Highlights" beginning on page 69, and NECA meetings beginning on page 137.

CODE PROBLEMS

What kind of problems in code application and interpretation do experienced electrical inspectors discuss at code clinics during Section meetings of the International Association of Electrical Inspectors? Associate Editor J. F. McPartland followed the discussions at the Eastern Section meeting in Monticello, selected those subjects which caused the most lively comment there, and analyzed the arguments in "Code Toughies" beginning on page 78.

ARTIFICIAL DAYLIGHT

Grading and processing furs is a critical process requiring a lighting system which in color quality closely approximates natural daylight. A high level, 100 footcandles, lighting system designed for the Fouke Fur Company of St. Louis by the Sach's Electric Company employs a combination of different fluorescent lamps with incandescents to achieve the desired overall color temperature between 6500 and 6800 degrees Kelvin. Details of the installation are described by Assistant Editor W. J. Martens on page 76.

FIRE DETECTION

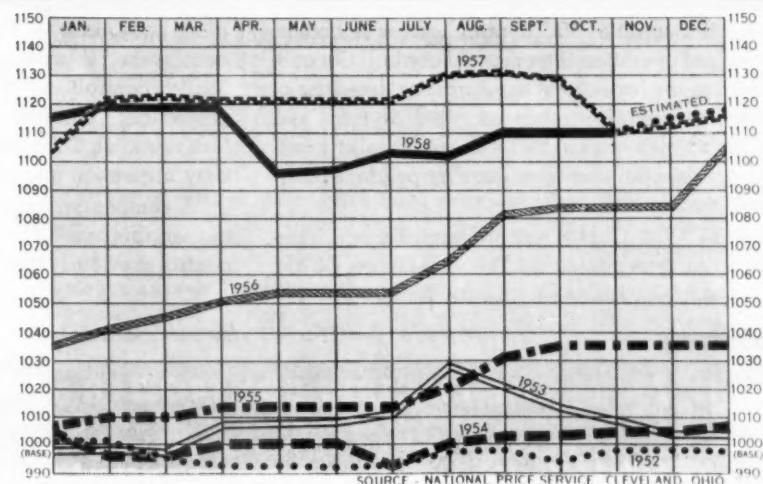
On July 1 the city of Quincy, Mass., adopted an ordinance requiring all new residential buildings to be equipped with complete automatic fire detection alarm systems. Assistant Editor W. J. Novak followed up the project, explored the background and the procedures being followed. His report, "Fire Detection Alarm Ordinance", page 72, will provide valuable guidance for those who may want to encourage similar protective measures in their own communities.

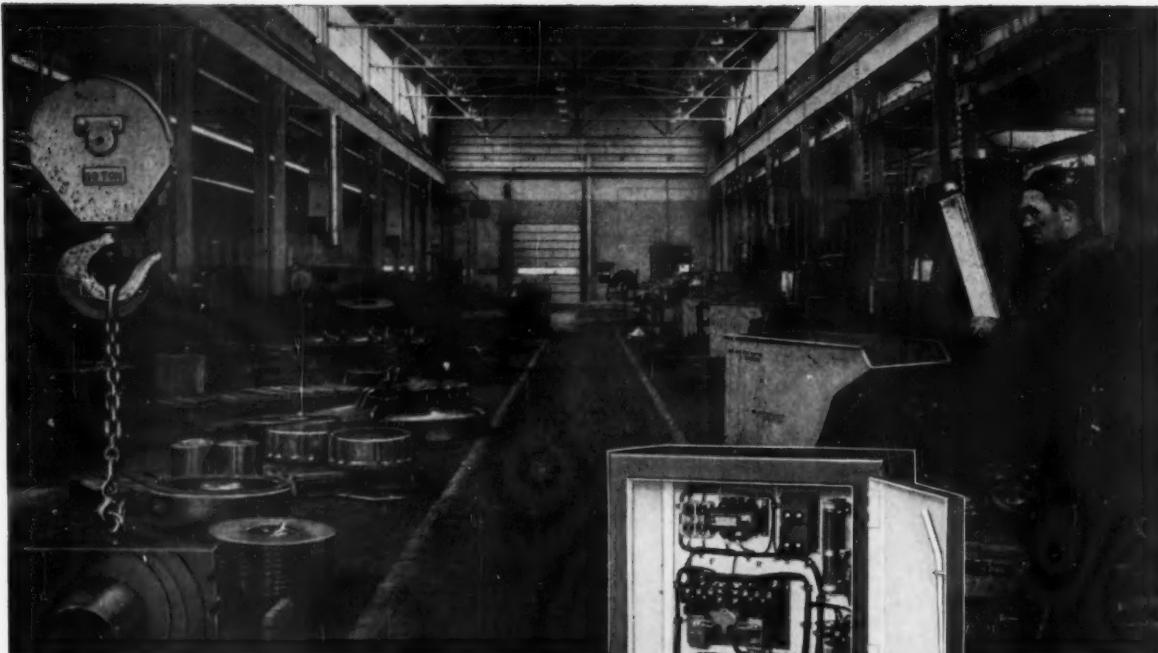
HIGH CYCLE POWER

Aircraft electrical equipment operating at 400 cycles are usually powered in the hangar by portable frequency converters. American Airlines' new jet hangar at New York International Airport provides a high-cycle distribution system with plug receptacles in each service area, see page 62.

ELECTRICAL MATERIALS COST INDEX

BASE LINE IS 1000 AND
REPRESENTS COSTS OF A
TYPICAL ASSORTMENT OF
MATERIALS FOR A SELEC-
TED JOB AS OF NOVEMBER
1, 1951. THE INDEX POINTS
REPRESENT THE VARIA-
TION OF THESE SAME MA-
TERIAL COSTS AS OF THE
FIRST OF EACH MONTH.

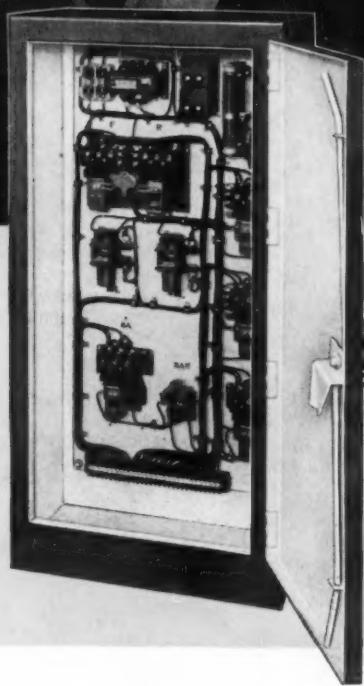




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with
Frequency
Plugging Relay

• Designed specifically for light industrial AC cranes, EC&M's full magnetic "VL" control assures smoother, more efficient operation than manual control. On cab-operated cranes, operators have greater freedom of movement with small masters mounted up-front and controllers at rear of cab. "VL" control is also available for cranes operated from floor by pendant push-button master.

EC&M "VL" Controllers are compact and have vertical-action type contactors. The well-known EC&M

Frequency Relay provides accurate control of accelerating operations on Dynamic Lowering hoists. Timed acceleration is provided for Reversing hoist, Bridge or Trolley controllers. "VL" controllers have "individual protection," eliminating the need for separate protective panel. They are front-connected and wired for easy inspection and maintenance.

A companion line to EC&M's "PT" Control for DC cranes, this new "VL" control is far superior to manual control previously specified purely on the basis of price.

*NEMA Service Classification II applications

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THE ELECTRIC CONTROLLER & MFG. CO.
A DIVISION OF THE SQUARE D COMPANY
CLEVELAND 28 • OHIO



1587

Washington Report

DECEMBER • 1958

Better business is forecast for 1959, but will not reach boom proportions, according to most Government economists. Except for auto sales, on which trends remain difficult to appraise, forecasters expect most economic indicators to set new records next year, as old inventories are depleted and new ones are built up. Here's how the economists now appraise the year ahead:

- **Output of goods and services (GNP)** may hit a \$480-billion annual rate by late '59. The 4th quarter (1958) pace is an estimated record \$450-billion.
- **Industrial production** should pass the 1957 peak of 145% (FRB Index —1947-49=100) by mid-1959, earlier if auto production picks up. Index for October was 138%, but remained low then due to auto work stoppages.
- **New construction** will hit a new peak of \$52.3 billion, up 7% from the expected \$48.8 billion in 1958, according to forecast of Commerce and Labor Depts. Increase will result primarily from expanded highway and residential construction, the forecasters report.
- **Personal income**, a prime indicator of consumer buying power, is expected to continue to hit one new record after the other next year. Annual rate in October was \$357.5 billion, down \$300 million from September peak as a result of strikes at that time.
- **Auto production** for 1959 is variously estimated at 5.5-million to 6-million-plus units. A "normal" year is now estimated at about 6 million, but 1958 fell far short of this figure.
- **Steel production** is expected to average about 80% of capacity in '59 (approx. 112,000 tons), compared with 85,000 tons this year. Current production is at rate of about 75% of existing 141,000 tons annual capacity.

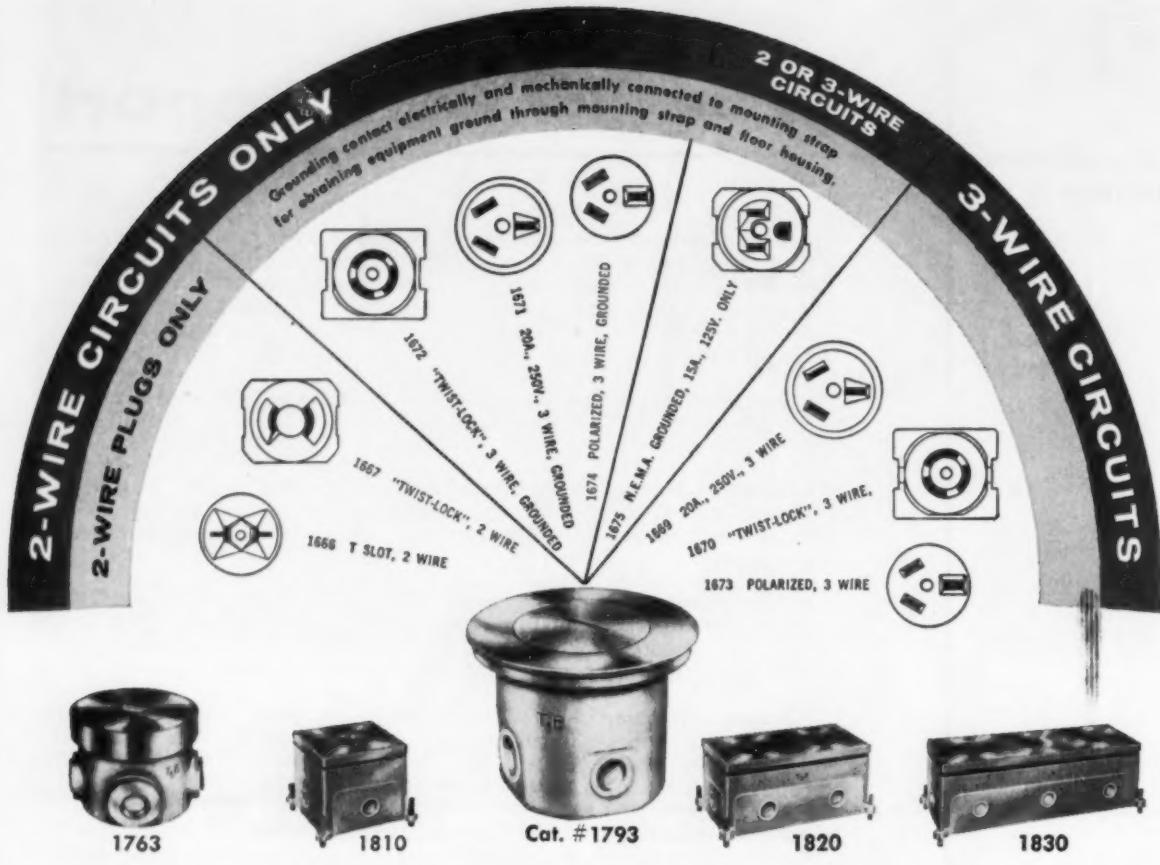
The new 86th Congress starts fresh next month, with all old legislation left pending now dead. Eisenhower's goal will be to hold his new (fiscal 1960) budget proposal inside \$80 billion, near the current (1959) fiscal year estimated \$79 billion. But pressure for still more Government spending may be expected from the new and more liberal Democratic Congress, for such programs as:

- More money for housing
- A new farm program
- Aid to depressed areas
- More water conservation projects
- Expanded activity by the new Space Agency
- Expanded use of the atom for peace (including Federal power).

Output of electric power has been running about 3% ahead of comparable periods a year ago in recent weeks. This increase will expand in the months ahead, if industrial output climbs as has been predicted.

New construction expenditures dipped in October to \$4.8 billion, down \$72 million from September's record high. This was 3% above the \$4.6 billion of October 1957. Total for first 10 months was \$41.1 billion, up 2% from the \$40.5 billion for similar 1957 period. Private spending in October totaled \$3,196 million, while public construction amounted to \$1,567 million.

Private housing starts in October rose to 109,000, highest for any month this year. Public housing starts totaled 2,000. Total starts gave a seasonally-adjusted annual rate that topped any month since the 1,285,000 annual pace set in September, 1955, three years earlier.



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Here's a convenient money saver from T&B . . . designed to make the use of many types of receptacles easier and more readily available. T&B receptacles (there's one for every need) fit all T&B floor boxes . . . and they can be changed in a matter of minutes should you later install equipment

which requires a change in receptacles.

For full information on T&B floor boxes and receptacles, contact your T&B distributor today — he will show you how to save money on installed costs, save time, and safety-ize your job with T&B floor box receptacle combinations.

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The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs.

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Furthermore, the zinc chromate coating, both inside and out, doubles the protective life of the galvanizing on the conduit. Color-coded thread protectors provide quicker, surer, safer handling.

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All Pittsburgh Standard Hot-Dip
Galvanized Conduit has

• HOT-DIP GALVANIZED THREADS

• ZINC CHROMATE COATING

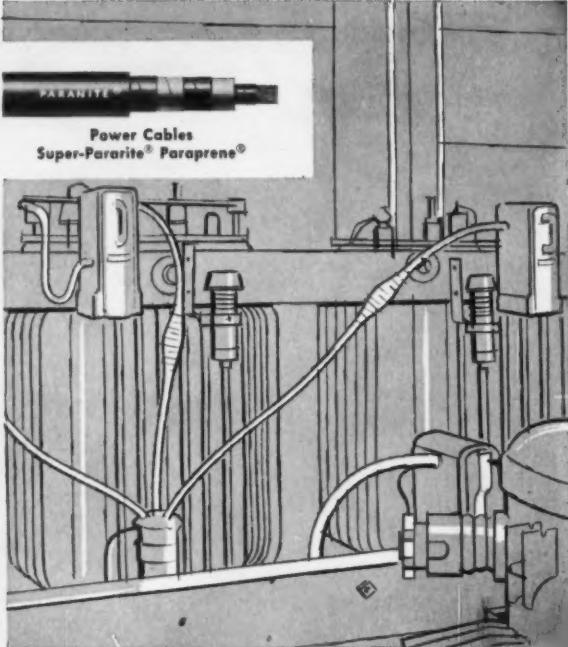
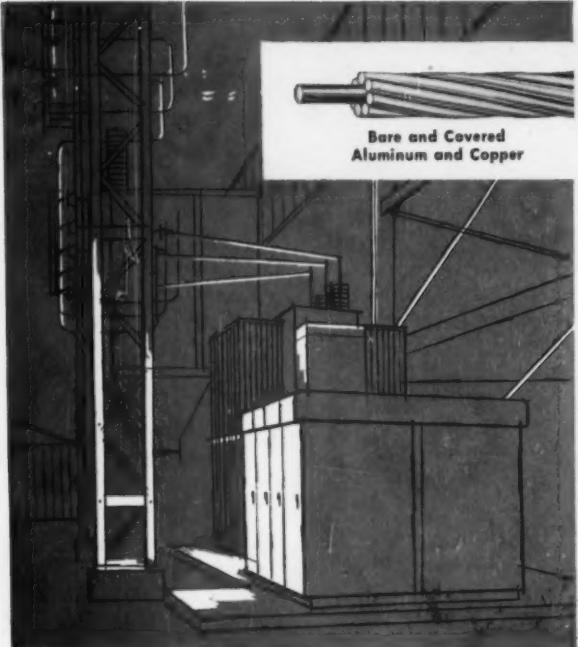
• COLOR-CODED THREAD PROTECTORS



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PLANTS AT MORRISVILLE AND ETNA, PA.

RIGID STEEL CONDUIT • ELECTRICAL METALLIC TUBING • ELBOWS • COUPLINGS • FITTINGS



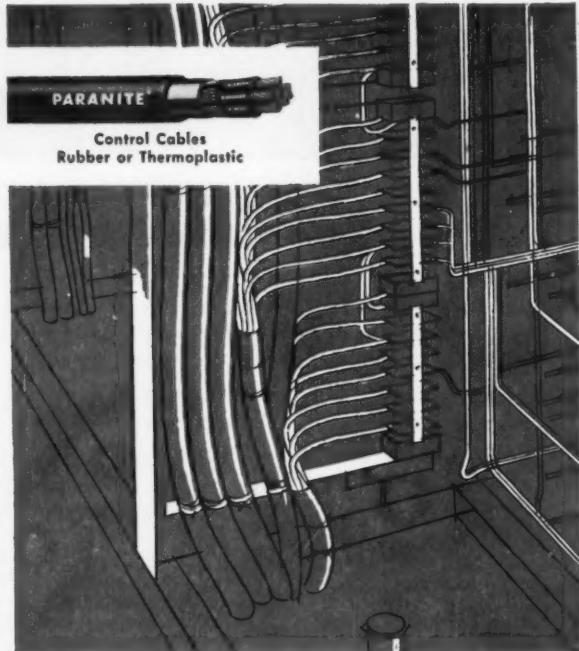
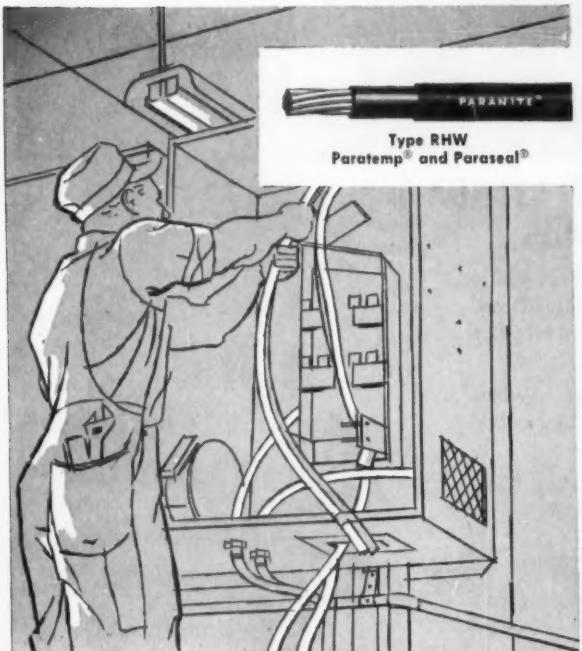
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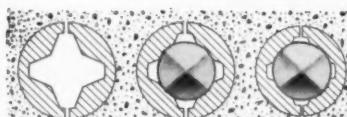
Distribution Nerve-Center Secured with DIAMOND "DHD®" Hammer Drive Anchors

This important underground transformer installation of a large eastern power company may be out of sight...but it's never out of mind as far as power engineers are concerned. They examined every component put into this installation for efficiency, long-term dependability and overall

ability to do the best possible job, economically. They choose DIAMOND "DHD" Hammer Drive Anchors to secure (1) Secondary Bus Racks, (2) "L" Hangers, (3) Cable Stanchions, and (4) Oil Fuse Cutout Racks. In each case they chose "DHD" Anchors to be sure it's secure!

Specify new design
DIAMOND "DHD"
Hammer Drive Anchors
for fast installation
... greater holding power

Internal ribs in the aluminum Hammer Drive Expansion Shield allow it to adjust to off-size holes. Drill the hole, hammer home the nail and the "DHD" Anchor develops the greatest sustained holding power ever possible in a fastener of this type — regardless of variations in hole diameter.



Diamond makes a full line of Fasteners for masonry and hollow walls, Expansion Bolts and Shields, Masonry Drills, Conduit and Cable Straps and Clamps, and Pole Line Hardware.

For Heavy Duty
Anchoring Jobs —
DIAMOND DOUBLE KEYSTONE SHIELD®



For over 50 years the Double Keystone Machine Bolt Shield has been specified by industry to secure heavy loads. Exclusive nutstop prevents overtightening and pullout. Shield expands parallel along entire length to accommodate variations in hole size.

DIAMOND EXPANSION BOLT CO., INC.
500 North Avenue • Garwood, New Jersey

Stocking Warehouses: Atlanta, Boston, Chicago, Dallas, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Seattle, St. Louis, Washington, D.C. Also, Montreal, Toronto and Vancouver, Canada.

Index of Phelps Dodge

Wires and Cables	Type Letter	Habirshaw Trade Name or Designation	Maximum Operating Temperature	USE
	R	Flamestop Code	60 C (140 F)	Dry Locations
	RF	Flamestop Code	60 C (140 F)	Fixture Wire
	RH	Flamestop Heat-Resistant	75 C (167 F)	Dry Locations
	RW	Flamestop Moisture-Resistant	60 C (140 F)	Dry and Wet Locations
	RH-RW	Flamestop Heat or Moisture-Resistant RH-RW	75 C (167 F) as RH 60 C (140 F) as RW	Dry Locations as RH Dry and Wet Locations as RW
	RHW	Flamestop Heat and Moisture Resistant	75 C (167 F)	Dry and Wet Locations
	RHH	Flamestop Heat-Resistant	90 C (194 F)	Dry Locations
	RL	Rubber Lead	60 C (140 F)	Wet Locations and other Special Conditions
	RHL	Heat Resistant Rubber Lead	75 C (167 F)	Wet Locations and other Special Conditions
	NM	PD-X Nonmetallic-Sheathed Cable	60 C (140 F)	For Wiring Houses, Rural Buildings, Small Stores, and Shops.
	UF	Perma-Dure Nonmetallic-Sheathed Cable	60 C (140 F)	UF: Underground Feeder and Branch Circuit Cable for Direct Burial.
	UF-NMC	Perma-Dure Nonmetallic-Sheathed Cable	60 C (140 F)	NMC: For Interior Wiring in Moist or Corrosive Locations.
	TW	Habirdure Thermo-plastic Insulated	60 C (140 F)	Dry and Wet Locations
	TF	Habirdure Thermo-plastic Insulated	60 C (140 F)	Fixture Wire
	TW	Petro-Dure Thermo-plastic Insulated Nylon Jacketed	60 C (140 F)	Moist locations and where exposed to mineral oil, liquid gasoline and gasoline vapor.
	None	Habirdure Machine Tool, Control, and Switchboard Wire	90 C (194 F) in air 80 C (176 F) in oil	Machine Tool, Control and Switchboard Wiring

PHELPS DODGE COPPER PRODUCTS CORPORATION

Wires and Cables



Wires and Cables	Type Letter	Habirshaw Trade Name or Designation	Maximum Operating Temperature	USE
	None	Habidure Appliance Wire	105 C (221 F) IN AIR 80 C (176 F) IN OIL	Appliance Wiring
	SE	Service Entrance Type SE—Style U Unarmored	75 C (167 F)	Service Entrance or Combination Service Drop & Service Entrance
	SE	Service Entrance Type SE—Style A Armored	75 C (167 F)	Service Entrance or Combination Service Drop & Service Entrance
	SD	Service Drop Type SD	60 C (140 F)	Service Drop
	USE	Service Entrance Type USE	60 C (140 F)	Underground Service Entrance, Direct Burial.
	V	Varnished Cambric Braided	85 C (185 F)	Dry locations only. Smaller than No. 6 by special permission.
	VL	Varnished Cambric Lead	85 C (185 F)	Wet or Dry locations. Smaller than No. 6 by special permission.
	None	Type RR	75 C (167 F) Low Voltage 85 C (185 F) High Voltage	General Purpose for Direct Burial, Aerial, Conduit and Underground Duct Installations.
	S or SO	Hard Service Cord	60 C (140 F)	Pendant or portable extra hard usage in damp locations; SO for oil resistance.
	SJ or SJO	Junior Hard Service Cord	60 C (140 F)	Pendant or portable hard usage in damp locations; SJO for oil resistance.
	SP (Formerly PDSJ)	All Rubber Parallel Cord	60 C (140 F)	For use in pendant or portable applications in damp locations not subject to hard usage.

HABIRSHAW BUILDING WIRES AND CABLES

MR. ELECTRICAL CONTRACTOR:

LOOK ADS

INTRODUCE YOU AS A

HOUSEPOWER SPECIALIST

TO HELP YOU

SELL MORE, EARN MORE



The entire HOUSEPOWER program this year focuses on you. Yes, you—the electrical contractor.

Beginning National Electrical Week (February 9-14, 1959) a series of ads in LOOK Magazine, sponsored by electric utilities through Edison Electric Institute, present you as a "HOUSEPOWER Specialist"—using the familiar LOOK Photo Quiz format. Each picture in the quiz gets

across another reason why every home needs a truly modern wiring system, thus preselling homeowners on the need for full HOUSEPOWER. Each ad is geared to increase the demand for what you have to sell—full HOUSEPOWER—and tells the reader what to do to get it: Call you, a "HOUSEPOWER Specialist."

EVERYTHING YOU NEED TO WIRE UP PROSPECTS FOR PROFIT!

HOUSEPOWER Campaign Guide

Shows you tested ways of making the big LOOK HOUSEPOWER series pay off for you. Shows specific ways that you can profit as a HOUSEPOWER Specialist in your area.

Direct Mail Materials

Folders to fit all your direct mail needs: Ideal for follow-ups with prospects; perfect for leaving with neighbors of customers. Space for your imprint. Catalogue shows folders illustrated in detail. Send for it.

Ad Materials for your own Dynamic Local Campaign

The most live-wire ad mats yet devised to get you direct line leads. Each mat, in the economical size, is built around a HOUSEPOWER Phototest. Home-makers have fun with the test, learn how to get in touch with you to get a HOUSEPOWER Rating.

Special HOUSEPOWER Phototest Folder

The best door opener ever! Here, in one folder, Edison Electric Institute has reprinted all the HOUSEPOWER Phototest ads which appear in LOOK. Each page directs the homeowner to you. It's a big (LOOK size) folder which sells your services. Your name can go on it, of course.

Plan now to make Spring '59 your most profitable season ever. The hard-selling, sales pulling power of LOOK and the HOUSEPOWER Phototests are all planned for your benefit. In addition, HOUSEPOWER ads will back your sales

program all through the year. Take advantage of the best business building plan ever offered. Check with your local electric utility or association to find out how you can become a HOUSEPOWER Specialist in your area. Or write to us.

National Wiring Bureau
155 East 44th Street
New York 17, N.Y.

a sponsor of

HOUSEPOWER
TRADE MARK

Season's Greetings.



GOOD LUCK GOOD HEALTH
GOOD CONNECTIONS

HARVEY HUBBELL, INCORPORATED • BRIDGEPORT 2, CONNECTICUT
QUALITY WIRING DEVICES



Quality...you can put your finger on ...

EVEN

A.C. PressSwitch with lighted button

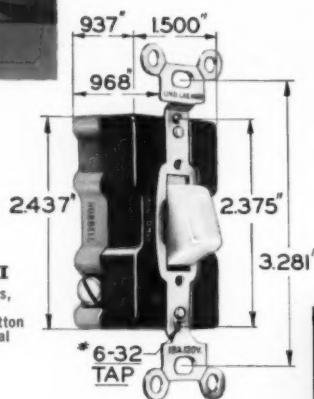
TRADEMARK

No stumbling or fumbling in the dark to find this switch. A tiny subminiature, neon bulb in the button is always "on" when the switch is "off", showing you right where it is, day or night. It's the last word in switch safety, luxury and convenience, ... and it costs only pennies a year to operate.

This lighted button "Presswitch" is the latest in Hubbell's complete line of "Presswitch" units, now available both lighted and unlighted and in 15 and 20 ampere ratings. All "Presswitch" devices fit standard boxes and utilize standard wall plates. No special wiring is involved.



schools



CAT. NO. 1257-I
15 amperes, 120 volts,
A.C. Single-pole,
with lighted ivorine button
and feed-thru terminal



nurseries



hospitals

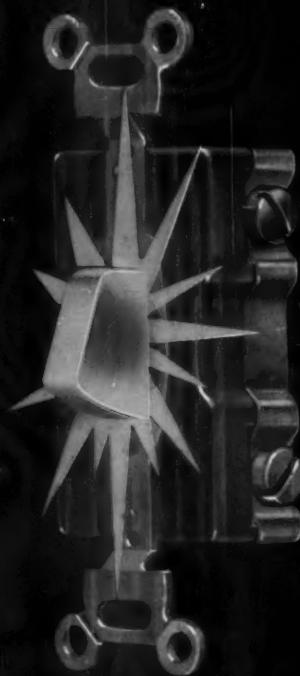


factories



**Highest Quality
wiring devices
machine screws**

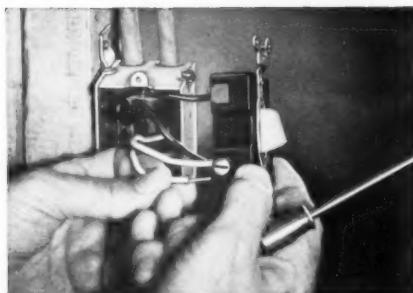
IN THE DARK!



COSTS ONLY
A FEW PENNIES
A YEAR

Estimated cost
of operating the
lighted button units
is about 3¢ a year.

*Supplied in both 15 and 20 ampere ratings, either
with or without lighted button. All 20 ampere
units will be available on or about December 1st.*



**FEED-THRU TERMINAL
SIMPLIFIES WIRING**

A feed-thru terminal on each of the single-pole units speeds and simplifies wiring by eliminating the usual ground wire splice. Wires normally spliced are securely joined by inserting them under a screw terminal provided for the purpose.

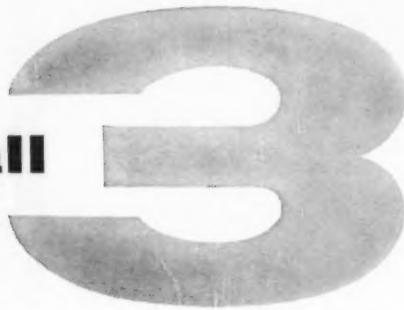
Both 15 and 20 ampere standard (non-lighted) "Presswitch" units are supplied in single-pole, double-pole, 3-way and 4-way, rated 120-277 volts.

Lighted button switches are supplied in single pole and 3-way, rated 120 volts only. 277 volt units are available on special request. 4-way lighted button units are also available on special order.



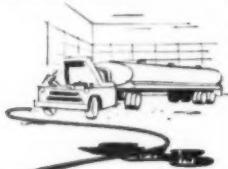
HARVEY HUBBELL, INCORPORATED
BRIDGEPORT 2, CONNECTICUT
IN CANADA, SCARBOROUGH, ONTARIO

Diamond has all portable cords



Red-D-Prene®

Neoprene Sheathed



for hot, oily locations

Black Diamond

Rubber Sheathed



for general purpose use

Signal Yellow

Thermoplastic



for all locations where heat
is no problem



Red-D-Prene for mill and plant use is designed with tough, oil, heat and flame resistant Type MD (Mill Duty) neoprene jacket in industrial red for ready identification.



Black Diamond has durable rubber jacket protecting against alkalies, acids and moisture. Very flexible construction prevents kinking in service.



Signal Yellow has a jacket of yellow thermoplastic that is quickly seen... clean to handle... smooth sheath will not readily collect dirt. Easy to pull.

ORDER FROM DIAMOND TODAY!



DIAMOND
WIRE and CABLE Company

Sycamore, Illinois

WAREHOUSE: BIRMINGHAM, ALABAMA

When you select a Wagner  Transformer...
**YOU GET THE TYPE BEST SUITED FOR
 YOUR PLANT ELECTRICAL SYSTEM...**
 PLUS...the assurance of continuous, dependable service!

If you are planning a new plant distribution system...modernizing your present one...or adding to its capacity to meet increasing demands for power...it will pay you to specify Wagner Transformers.

For your main plant substation, Wagner Liquid Filled Industrial Power Transformers are available in standardized ratings through 10,000 kva.

For your load centers, Wagner can supply Unit Substation Transformers in any of the types shown below, furnished with suitable incoming line sections, to meet your particular requirements. These PRE-DESIGNED transformers will save you time and save you job engineering costs. You can specify the secondary switchgear you prefer.

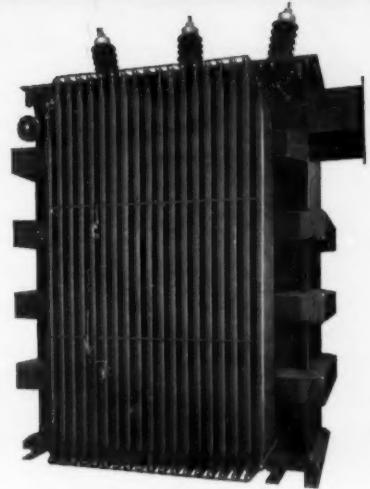
All Wagner Industrial Transformers are liberally designed, sturdily constructed, thoroughly tested and able to meet the heaviest industrial demands. They assure continuous dependable power for years to come.

For expert advice on your present and future plant transformer needs, call or write the Wagner branch near you.

Wagner Electric Corporation

6413 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

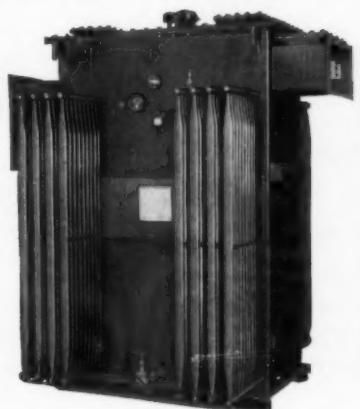


**WAGNER INDUSTRIAL
 POWER TRANSFORMERS**

Oil-filled, for outdoor installation, available through 10,000 kva, 67 KV and below. Noflamol filled, for explosive atmospheres, available through 7,500 kva, 15 KV and below.



NOFLAMOL Non-inflammable liquid-filled. For indoor or outdoor installation, where explosive liquids or gases are present. The close-coupled design illustrated fits flush against switchgear enclosures. Throat connected designs are also available. 55°C rise, self-cooled or forced-air cooled.



OIL-FILLED Generally installed outdoors. Can be used indoors in fireproof vaults. Outdoor transformers can be connected to indoor switchgear using weather-proof bus-duct. 55°C rise, self-cooled or forced-air cooled.



SEALED DRY-TYPE Suitable for indoor or outdoor use, completely fireproof, easy to clean and maintain. Sealed tank is filled with nitrogen under low pressure. Insulated for 150°C rise, self-cooled.

SCHOOL SAVES \$4,397.26 IN MATERIAL COSTS WITH CONVERSION TO ALUMINUM BUILDING WIRE

The figures in the chart at right were prepared recently as an actual estimate for conversion to aluminum primary and secondary feeder cables in a New York Junior High School.

\$4,397.26 saved in materials . . . and this is not an unusual saving! It is typical of the savings available to contractors and industrial users with KW Aluminum Building Wire.

Easy To Work As Copper

Besides big savings, KW Aluminum Building Wire offers you *many more* important advantages over copper: Lighter weight for easier handling and installation . . . Greater flexibility for easier bending, forming, cutting and training . . . Cooler operation based on equal conductivity . . . and more.

To bring contractors and industrial users greater cable values than ever before, KW combines the knowledge of two great plants. One, at Newark, Ohio, has pioneered the development of aluminum conductors; the other, at Bristol, Rhode Island (formerly U. S. Rubber Wire and Cable Division), offers 68 years experience as "the masters of insulation." KW offers you a wide range of insulations.

Conversion Estimating Service

To give you practical assistance in applying the advantages of aluminum to your jobs, KW will provide, at no obligation, the services of the new "Aluminum Conversion Estimating Group." Please arrange this service through the KW Sales Representative at the Kaiser Aluminum Sales Office listed in your telephone directory.

Kaiser Aluminum & Chemical Sales, Inc., Executive Office, Kaiser Bldg., Oakland 12, Calif.; General Sales Office, Palmolive Bldg., Chicago 11, Ill.



IF IT CARRIES CURRENT,  CARRIES IT!

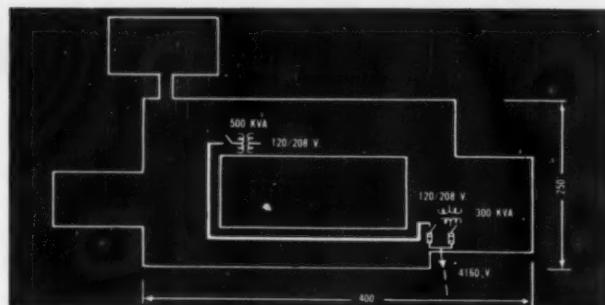
SEND FOR YOUR FREE BROCHURE!

Kaiser Aluminum & Chemical Sales, Inc.
Advertising Dept. 965
919 N. Michigan Ave., Chicago 11, Ill.
Please send "Power And Lighting
Cable" brochure to:

NAME _____

ADDRESS _____

CITY _____ STATE _____



Typical Cost Comparison—Aluminum vs. Copper

HIGH SCHOOL 120,000 Sq. Ft.

Summary Of Material and Cost Date Rec'd. 7/ 8/58
Aluminum Conversion Estimating Service Date Ref'd. 7/16/58

	Wire	Conduit	Total	% SAVING
Aluminum Cost	\$ 6,834.47	\$ 6,495.60	\$13,330.07	
Copper Cost	12,002.13	5,725.20	17,727.33	
Difference	\$ 5,167.66	\$ -770.40	\$ 4,397.26	25

This estimate is for:
 (X) Primary Feeders Voltage
 (X) Secondary Feeders 2,400/4,160
 () Branch Circuits 120/208
 Type Wire
 5 KV Shielded
 TW-RHW

Wire Size	ALUMINUM WIRING			COPPER WIRING	
	Total Wire In Feet	Total Wire Cost	Total Wire In Feet	Total Wire Cost	
(TW INSULATION)					
8	160	\$ 5.24	160	\$ 7.12	
6	2,920	259.88	2,760	455.40	
4			3,200	723.20	
2			1,600	185.60	
1			560	652.68	
0			1,840	581.76	
00			2,720	2,701.44	
000			2,640	798.72	
0000			4,640	1,744.64	
250			3,360	2,768.64	
300					
350					
(RHW INSULATION)					
2	710	94.43	710	159.75	
2/0	400	72.80	1,400	456.40	
3/0	1,000	226.00			
350			1,200	1,221.60	
500	1,200	732.00			
(5 KV Shielded)					
2	2,130	749.76	2,130	1,290.78	
1/0			TOTAL	25,720	\$ 12,002.13
			TOTAL	25,720	

Conduit Size	Total Conduit In Feet	Total Conduit Cost	Total Conduit In Feet	Total Conduit Cost
1	40	\$ 15.60	40	\$ 12.00
1 1/4				
1 1/2			40	18.40
2	1,530	948.60	1,990	1,233.80
2 1/2	890	854.40	850	816.00
3	1,800	2,268.00	2,500	3,150.00
3 1/2	1,460	2,409.00	300	495.00
	TOTAL	5,720	\$ 6,495.60	TOTAL
				5,720
				\$ 5,725.20

Watson-Flagg figures costs closely



Garden State Plaza Shopping Center, Paramus, N. J. Watson-Flagg Engineering Co., electrical contractor

but doesn't take chances!



"I've been connecting with Burndy for 30 years. They go on fast and they don't work loose. I know I don't have to worry when a job's connected with Burndy."

BEN KAHN, WATSON-FLAGG (Paterson, N. J., office)
superintendent in charge of Garden State job.

The performance of every piece of electrical equipment on the Garden State Plaza job depends on the performance of the electrical connectors, yet these connectors accounted for less than $\frac{1}{4}$ of 1% of the total electrical job. For less than $\frac{1}{4}$ of 1%, Watson-Flagg didn't take a chance...they installed only Burndy connectors.

Garden State Plaza opened without a hitch, and Watson-Flagg is now installing Burndy connectors on the expansion planned to make it one of the largest shopping centers in the country with a power system of an ultimate 18,000kw capacity.

The reputation of a contractor depends on the quality of his jobs and for less than $\frac{1}{4}$ of 1%, it doesn't pay him to take a chance on the quality of the connectors he installs. More than 30 years experience has taught contractors that they don't take chances when they connect with

BURNDY

58-29

Norwalk, Connect.

In Europe: Antwerp, Belgium

Toronto, Canada

EXTRA VALUES

1



FORM 406
FLUORESCENT LUMINAIRE

2



"TEE-LIGHTING"
FLUORESCENT SYSTEM

3



"POWER PACK"
MERCURY LUMINAIRE

INTERNAL FAN COOLING

- Air-circulation system—a G-E exclusive—boosts light output of luminaire up to 25%.
- Four Power Groove lamps generate 37,200 lumens.
- No increase in unit cost.
- Completely factory-assembled and tested; shipped in *single* carton.
- Ideal for business streets, traffic arteries, expressways, interchanges, parking lots, shopping centers.

NEW STREET- LIGHTING CONCEPT

- Ideal for "prestige" lighting of business whiteways.
- Highest utilization efficiency of any fluorescent system.
- Greater driver comfort.
- Uni-directional reflectors in parallel units aim light across street.
- Parallel fluorescent units, 18,600 lumens each; transverse unit, 18,600 to 55,800 lumens.

NEW BUILT-IN BALLAST

- Only two terminal connections—saves up to 30 minutes per unit installation.
- Eliminates need for ballast-adapters or transformer-base poles—saves \$30 to \$65 per pole.
- Same outstanding lighting efficiency you have experienced with the General Electric Form 400—best in the industry.
- Low ballast losses.

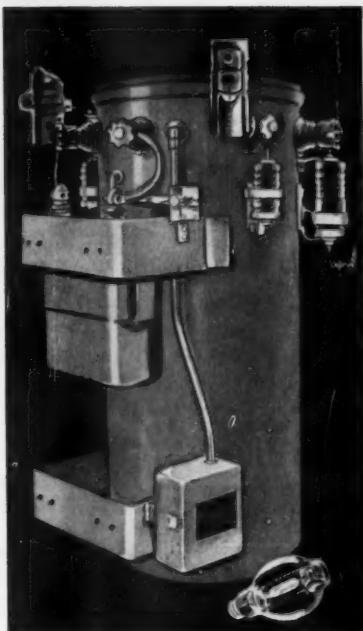
in Outdoor Lighting from General Electric

4



**NEW FORM 400C
MERCURY LUMINAIRE**

5



**FOR 400-WATT
SERIES APPLICATIONS**

ONE-PIECE REFLECTOR HOUSING

- New General Electric one-piece, anodized-aluminum reflector-housing.
- Lighter weight for easy installation and maintenance; larger volume for effective heat dissipation.
- Outstanding versatility; operates five lamps, provides four IES distribution types.
- With precision-molded glass refractor, provides unequalled photometric performance.

BALLASTLESS MERCURY SYSTEM

- New 400-watt mercury lamp with built-in cutout—**exclusive G-E development** gives reliable operation.
- **Packaged** substation-type regulator—another G-E **exclusive**, combines all control equipment in self-contained, pre-assembled package.
- Eliminates need for separate ballasts for series circuits.
- Reduces costs of installation, operation, and maintenance.

Check these
EXTRA VALUES
for the complete story
on General Electric's
new Outdoor Lighting
products

- | | |
|----------|--|
| 1 | FORM 406
FLUORESCENT LUMINAIRE |
| 2 | "TEE-LIGHTING"
FLUORESCENT SYSTEM |
| 3 | FORM 400 "POWER PACK"
MERCURY LUMINAIRE |
| 4 | NEW FORM 400C
MERCURY LUMINAIRE |
| 5 | BALLASTLESS MERCURY
(SERIES CIRCUIT) |

These five advanced-design lighting developments are headliners of more than a dozen new, redesigned products from General Electric. All are outstanding examples of General Electric product and research leadership. Each contains time- and money-saving features which mean **EXTRA VALUE** for you.

For full details, see your G-E Sales Engineer or Agent, or check the products you're interested in, fill out coupon and mail.

Section G450-4
General Electric Company
Schenectady 5, New York

Name _____

Company _____

Address _____

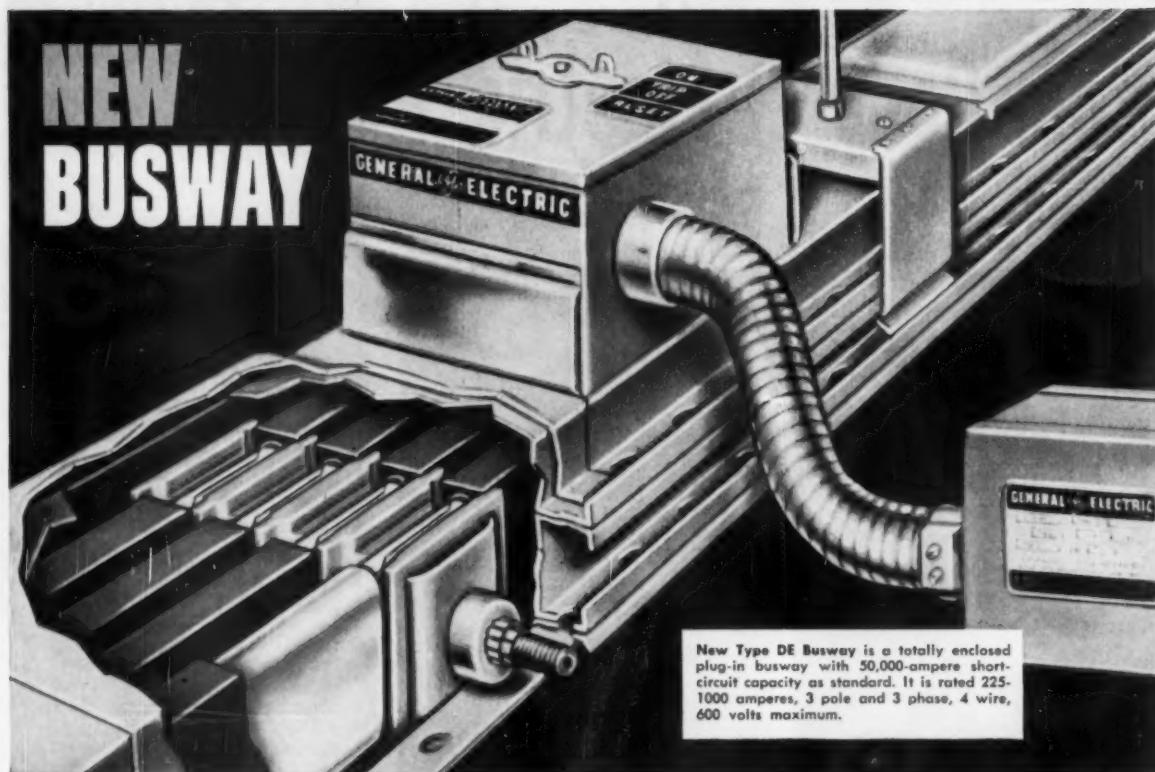
City _____ State _____

*Progress Is Our
Most Important Product*



**GENERAL
ELECTRIC**

New idea offers more for the money . . .



Ampere for ampere, the smallest, lightest, most efficient and rugged ever designed

With Type DE busway you get the very best for less. Although its cost, considering material alone, is slightly higher than conventional plug-in busway, DE will generally take one-third less time to install, bringing an overall first-cost saving of approximately 10%.

At the same time, DE busway will offer benefits no other system can provide, such as:

- **New Margins of Safety.** Butyl insulation is extruded over the full length of each bus bar, virtually eliminating traveling arcs and making each plug opening essentially "dead front."
- **Greater Flexibility.** A telescoping length eliminates need for exacting layouts. This, plus the feature that allows individual sections to be removed without disturbing adjacent sections, saves time, trouble and expense in new installations, system adjustments or change-overs.
- **Greater Efficiency.** DE offers lowest voltage drop available for plug-in busway of comparable rating. Requires virtually no maintenance. Unique one-bolt electrical joint maintains contact

between adjacent silver-plated aluminum bus bars with a ton of force, minimizing resistance and adding to efficient operation.

In short, Type DE busway incorporates all 22 of the features engineers, contractors and users say are important in busway design.

See your G-E sales representative or distributor for full details. Ask for a copy of Bulletin GEA-6173. Or write to **General Electric Company, Distribution Assemblies Dept., Plainville, Conn.**



GENERAL  **ELECTRIC**

No plastic electrical tape resists flame like SCOTCH No. 33!

REG. U.S. PAT. OFF.
BRAND



*The price per splice is less!
Let us prove it!*



"SCOTCH" Brand No. 33 Electrical Tape has a greater resistance to burning than any other plastic tape! And remember, only the genuine "SCOTCH" No. 33—*invented* as a new type of wire splice covering—has "Scotty's" plaid on the can and "No. 33" inside the red core. Ask your distributor about the full line of "SCOTCH" Brand splicing materials, or write us for complete information.

"SCOTCH" and the plaid design are registered trademarks of Minnesota Mining and Manufacturing Co., St. Paul 6, Minn.

MINNESOTA MINING AND MANUFACTURING CO.,
St. Paul 6, Minn., Dept. CB-128

All right!—show me! Send someone around to prove that the price per splice of "SCOTCH" No. 33 is less!

NAME.....

COMPANY.....

ADDRESS.....

CITY..... ZONE..... STATE.....

MINNESOTA MINING AND MANUFACTURING COMPANY

... WHERE RESEARCH IS THE KEY TO TOMORROW



Specify McGILL® *Levolier*® switches

...for guaranteed precision plus durability



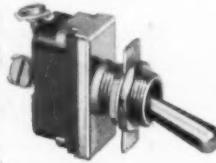
UNCONDITIONALLY GUARANTEED No. 41 single-pole, single-circuit, universal lever switch 6 amp. "T" 125V—3 amp., 250V. Only $\frac{5}{8}$ " thick, it is ideal for conduit box and canopy mounting for lighting and FHP motor control.



No. 100 single-pole, 15 amp. 125-250V, 1 HP 120-240V AC, normally "OFF" momentary contact switch. 1 amp., 125V— $\frac{1}{2}$ amp., 250V DC. Especially suitable for limit and safety control of industrial machinery.



No. 25 toggle switch carries a 6 amp. "T" 125V, 3 amp., 250V rating with an S.P.S.T. double-break mechanism. 1/3 HP AC 120-240V. Ideal for panel board, FHP motors, appliances, power tools, etc.



No. 90 $\frac{3}{4}$ HP capacity, 15 amp. 125V, 10 amp. 250V toggle switch with an S.P.S.T. mechanism. Designed for AC operation. Also carries 20 amp. 125V AC non-inductive load for heater applications. Also available in two circuit with center off and no off. Choice of terminals.



No. 29 single-circuit, .75 amp., 125V, normally "ON" momentary contact switch. Excellent for automatic control of lights as in door openings and closings.

No. 71 single-pole, single circuit, universal lever switch . . . the thinnest 6 amp. "T" 125V—3 amp., 250V switch of its kind on the market today—only $15/32$ " thick. Also with push button.

For complete descriptions of the entire McGILL line of switches, sockets, portable lampguards and other electrical specialties, write for catalog No. 84.

AVAILABLE FROM YOUR ELECTRICAL WHOLESALER

engineered electrical products

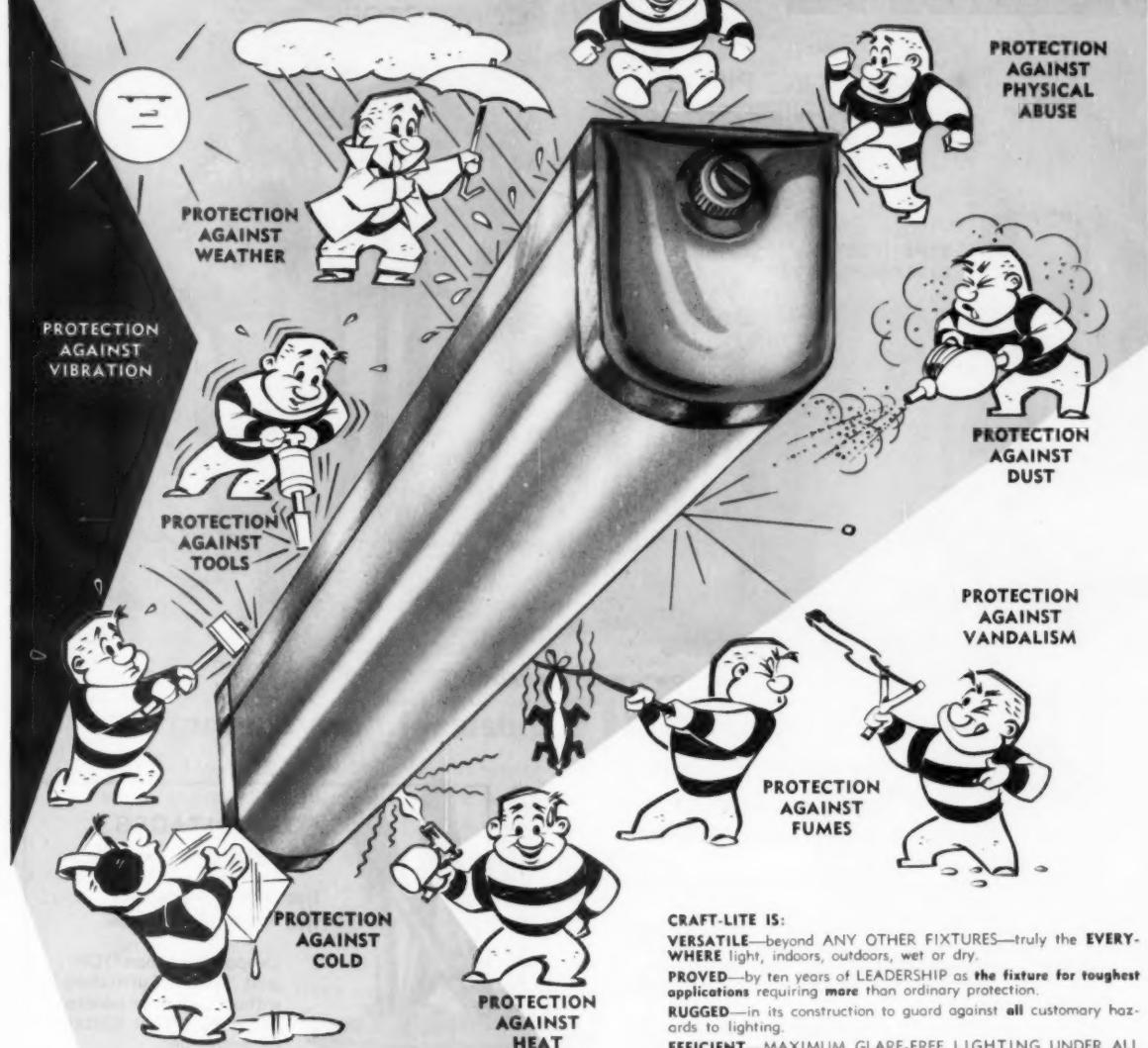
MCGILL®
precision needle roller bearings

McGILL MANUFACTURING COMPANY, INC., ELECTRICAL DIV., 450 N. CAMPBELL ST., VALPARAISO, INDIANA

PROTECTED LIGHTING!



SO RUGGED YOU CAN JUMP ON IT!



CRAFT-LITE IS:

VERSATILE—beyond ANY OTHER FIXTURES—truly the **EVERYWHERE** light, indoors, outdoors, wet or dry.

PROVED—by ten years of **LEADERSHIP** as the fixture for toughest applications requiring **more** than ordinary protection.

RUGGED—in its construction to guard against **all** customary hazards to lighting.

EFFICIENT—MAXIMUM GLARE-FREE LIGHTING UNDER ALL CONDITIONS, in truly modern, functional design.

SAFE—beyond ANY OTHER LIGHTING!

ALL THIS—and—A BONUS OF BEAUTY, TOO...with CRAFT-LITE.

WHAT'S YOUR TOUGHEST LIGHTING PROBLEM? WRITE US TODAY FOR THE CRAFT-LITE ANSWER TO THAT PROBLEM!

WHAT'S YOUR TOUGHEST LIGHTING PROBLEM?

PARAMOUNT INDUSTRIES, Inc.
G-1080 BALLINGER ROAD FLINT 4, MICHIGAN

NEW! O.Z. PULL-N-SPICE BOXES!

CONVENIENT·COMPACT·ECONOMICAL

**Exclusive moisture-, fungus-,
corrosion-resistant features!**

FOR VOLTAGES TO 600 v.

GREATER
CLEARANCES TO
GROUND AND BETWEEN
CONNECTORS

ONE-PIECE
CONNECTORS
FOR LOWEST
RESISTANCE

TYPE "YCE"—
EXPLOSION-PROOF

NO
NEED FOR
BARRIERS

TYPE "YCW"—WEATHERPROOF

O.Z. Pull-n-Splice Boxes mark a significant advance in pull box construction!

Their highly compact size saves more space than ever!

Their more efficient design means new savings in installation time and labor!

Their moisture-, fungus-, and corrosion-resistant features mean long, trouble-free service.

Still, with all their features, the new O.Z. Pull-n-Splice Boxes are smaller—and cost far less than conventional pull boxes... even late model competitive types! And, you get a bonus in high quality materials and workmanship so characteristic of all O.Z. products!

For complete information on these and the many other O.Z. products that mean more for you, call your local O.Z. distributor, or write to the company.

FOR VOLTAGES
TO 5000 v.

Type "YPW"—Weatherproof
Type "YPE"—Explosion-proof

Deeper dome than "YCW" and "YCE". Furnished without connector panels. Insulated pigtail splices recommended.



- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
- CONDUIT FITTINGS
- INTERLOCKED ARMOR CABLE FITTINGS



O.Z.

ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N.Y.

Sales Office and Warehouse: 406 So. Cicero Avenue, Chicago 44, Ill. • Esterbrook 9-0326
Office and Factory: 749 Bryant Street, San Francisco 7, Calif. • GARfield 1-7846





the worse the situation...

the more reason for using **TIREX**

TIREX cords and cables give longest service when not subjected to severe abuse. But when required, TIREX can take it. In snow and mud, under water and under pressure, TIREX cords and cables remain flexible, smooth, light and easy to handle, thanks to their original cured-in-lead construction. They won't snag or tear, and their fortified and tempered neoprene armor gives balanced resistance to abrasion, water, acids, oils, sunlight and flame.

Millions of feet of TIREX are on the job everywhere — transmitting power for mobile mining equipment, construction machinery and portable tools.

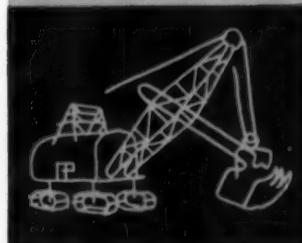
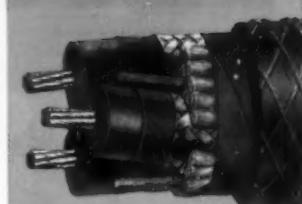
Simplesx

79 SIDNEY STREET, CAMBRIDGE 39, MASS.

"The American manufacturers of transoceanic telephone cables"



**WIRE & CABLE
C O M P A N Y**



new cool Sola ballast

**easily passes
“in-fixture” heat tests**

**coolest coils
and capacitor
give full ballast life**

**Ballast for two 40-watt rapid-start lamps
Catalog Number 670-109**



**no price penalty
for this premium
performance**

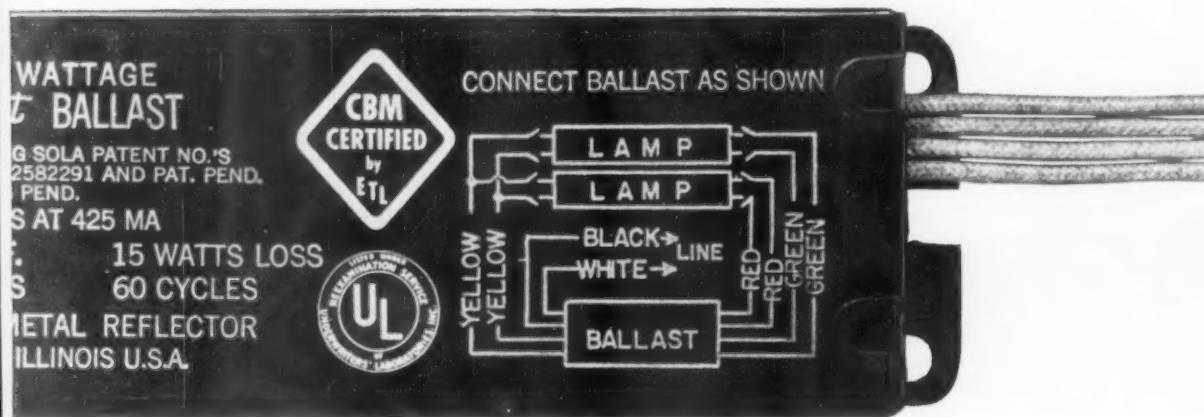
Now—totally new electrical and mechanical design sets highest standards of "in-fixture" ballast performance. This new two-lamp, 40-watt, rapid-start ballast is dramatic evidence of progress made possible by Sola's philosophy of conservative design. Sola views the ballast as integral with the lighting fixture and has consequently built its new ballast to pass exacting "in-fixture" tests and for actual operation under the most demanding conditions.

This new rapid-start ballast is designed to give only a 42°C coil-temperature rise when tested according to U.L. and E.T.L. methods. New circuitry increases ballast efficiency through reduced wattage loss.

The new ballast was tested in a four-lamp fixture, completely enclosed and surface-mounted on acoustical material. Temperature in the fixture channel was 18°C hotter than the usual 40°C ambient of U.L. and E.T.L. tests. Despite these severe test conditions, the following impressive results were recorded.

- Maximum coil temperature was 89.3°C. This is 15°C cooler than the limit of Class A insulation.
- Temperature of the capacitor's case under this especially severe test was within the heat limits of the capacitor's insulation.
- The "hot-spot" temperature on the ballast case was 81°C. This is 5°C cooler than premium-priced ballasts similarly tested, and it is 9°C cooler than the maximum allowed under U.L. fixture requirements.

This new level of cool ballast operation contributes to full ballast life. These improvements result from Sola's concept of ballast engineering that treats the ballast as integral with a fixture and part of the complete lighting system rather than as an isolated component. This approach has produced a major engineering breakthrough—the elimination of thermal insulating barriers which formerly confined ballast heat within the coil and capacitor compartment. Now, heat is far more easily dissipated through the case and fixture. The combination of fixture and Sola ballast now team up for cool, efficient, trouble-free operation.



Send for test ballasts or literature

Sola will furnish fixture manufacturers with samples of this new ballast. Write to us on your business letterhead, and a Sola sales engineer will promptly supply your test ballasts. Sola welcomes the challenge of having you evaluate this cool new ballast in your own fixtures. If you wish merely to examine data on the new model, please request Bulletin 17L-FL-352. Write to the Manager, Lighting Sales.

Sola Electric Co. (A Division of Basic Products Corp.), 4633 West 16th St., Chicago 50, Ill.



MICRO SWITCH Precision Switches



"LS" Series—Small, sealed, rugged two-circuit double-break limit switches. High electrical capacity. Three plunger type actuator designs and three rotary type actuators that are field adjustable.



"E6" Series—Compact enclosed limit switches available with a wide variety of actuators. Sturdy enclosures feature ready accessibility of terminals. Your choice of bottom and side mounting designs.



"200LS" Series—The new sealed "Plug-in Limit" switches. "Plug-in" unit can be replaced in 20 seconds! Cuts downtime. Available in six actuator designs. Two-circuit double-break.

HOW TO HELP your industrial customers make their production equipment more automatic

*Installation of switches like
these show immediate reduction
in costs... and good profits for you*

More and more industrial electrical contractors, working with plant production and electrical maintenance men and MICRO SWITCH Authorized Distributors, are finding that the automating of existing production equipment is just plain good business that pays off in profits.

MICRO SWITCH Precision Switches, because of their small size, high electrical capacity, long life and precise operation make practical the simple, inexpensive automation of production equipment.

Automation of existing production equipment saves in many ways—increases production, reduces spoilage, lowers production costs, makes industrial equipment safer, and improves quality.

Over two hundred MICRO SWITCH Authorized Distributors are ready to help you profit from this lucrative business. Look in the Yellow Pages. In the meantime, write for a copy of the MICRO TIPS Digest. It's full of switch application ideas.

MICRO SWITCH . . . FREEPORT, ILL.
A division of Honeywell

In Canada: Honeywell Controls, Ltd., Toronto 17, Ontario



"ML" Series—Heavy-duty sealed limit switches combine precise operation and long life. Available with plunger, roller-plunger, rod, and (as shown) adjustable roller arm actuators.



Honeywell
MICRO SWITCH PRECISION SWITCHES

NEW

ORANGEBURG® CA* CONDUIT



*Orangeburg Standard Conduit with Flush Coupling
Attached at Factory...No Extra Cost!

JOINS 26% FASTER

Because there are no separate couplings to assemble on the job, Orangeburg's new CA Conduit lays faster—costs less to install. In addition, there are no coupling cartons to handle, transport or store.

Orangeburg's new CA Conduit comes, at no extra cost, with a factory-attached coupling at one end and a standard 2° male taper at the other end. To join—CA's long, lightweight lengths are placed end to end—hammered home in a simple, one-step operation. Actual installations prove Orangeburg's new CA Conduit joins up to 26% faster!

What's more, because the attached coupling is flush with the

outside diameter of the conduit, new CA Conduit is easy to handle and store in neat, even stacks. And with the new flush coupling there's no need to "stagger" conduit joints in the trench. That means less cutting and tooling time.

New CA Conduit—like the millions of feet of Orangeburg Fibre Conduit in use since 1893—has self-sealing joints and impermeable walls that make it absolutely watertight. Its smooth 100% fibre raceway adds years to cable life.

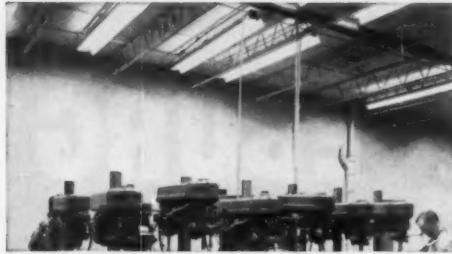
Specify new CA Conduit on your next job. This addition to Orangeburg's line is available in 2", 3", 4", 4½" and 5" sizes. Orangeburg's Standard and Noconcrete Conduit with separate sleeve couplings are available as always. Orangeburg Manufacturing Co., Inc., Orangeburg, N. Y. and Newark, Calif.

Orangeburg Fibre Conduit is distributed by Graybar Electric Co. and General Electric Supply Co. with branches and stocks in principal cities.

Whatever your customers want from higher output fluorescents... others are already getting... with G-E POWER GROOVES



THESE SATISFIED POWER GROOVE USERS EACH WANTED SOMETHING DIFFERENT . . . AND ARE GETTING IT!



SHAFER VALVE CO., MANSFIELD, OHIO

WHY POWER GROOVES? Because of improved color rendition and lower lamp replacement cost than mercury lamps.



JOHNSON-HILL'S DEPT. STORE, WISCONSIN RAPIDS, WIS.

WHY POWER GROOVES? To get more light (7½ times as much) from the same number of 40-watt lamps.



ERICKSON TOOL CO., CLEVELAND, OHIO

WHY POWER GROOVES? To get higher, more economical production lighting levels (160 footcandles), with no need for supplemental lighting.



GENERAL IRON & METAL CORP., CHICAGO, ILL.

WHY POWER GROOVES? To increase worker efficiency, speed-up production, reduce customer complaints.



CONVAIR, SAN DIEGO, CALIF.

WHY POWER GROOVES? To get the lowest operating cost compared to filament and mercury, and the highest level of light per watt.



PLA-MOR BOWLING ALLEYS, KANSAS CITY, MO.

WHY POWER GROOVES? To provide Pla-Mor lanes with a revolutionary, glare-free lighting system—superior to that in any other bowling center.

Don't experiment with your customers' lighting. Give them the newest fluorescent lighting that is endorsed by enthusiastic users all over the country. That one, of course, is the *tried-and-proved* General Electric Power Groove Lamp. Think of it! Almost twice the light of High Outputs—more than 2½ times the light output of slimlines! Power Groove users save up to 20% on initial cost, and keep maintenance at rock bottom at the

same time. Call your local General Electric Large Lamp salesman right now and let him explain the whole Power Groove story to you. Or write: General Electric Co., Large Lamp Dept. C-839, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

**NOW...
THE BEST
COSTS ^{EVEN} LESS
INSTALLED**



NEW... REPUBLIC ELECTRUNITE E.M.T. **SILVERSLICK** makes wire pulling up to 37% EASIER

Best before . . . even better now! New Republic ELECTRUNITE® E.M.T. with exclusive SILVERSLICK inside finish makes wire pulling up to 37% easier. Wire pushing is easier, too. Now wires can be pushed through longer runs and greater numbers of bends than was practical before.

SILVERSLICK—the silver-colored, slippery inside finish developed by Republic—combines with ELECTRUNITE's exclusive "INSIDE-KNURLING" to offer you greater installation advantages and economies.

Here's how it works: Wires ride over the knurling, thus cutting friction area approximately in half. And now, SILVERSLICK acts as a lubricant making wires slip smoothly, easily through the tube.

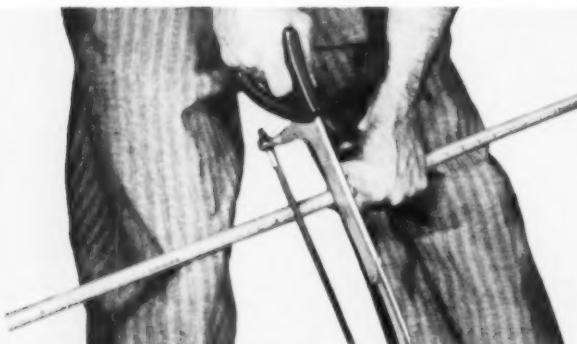
You've never had it so slick!

At no extra cost, SILVERSLICK now joins the other famous features of Republic ELECTRUNITE E.M.T. that make the best cost less installed. SILVERSLICK will be standard on all your shipments. Another reason why it will pay you to standardize on ELECTRUNITE.

ELECTRUNITE E.M.T. offers complete wiring protection. It is approved in the National Electrical Code, is produced to A.S.A. Specification C80.3, and Federal Specification WW-T-806, latest revisions. ELECTRUNITE E.M.T. carries the Underwriters' Laboratories Seal of Inspection.

To learn more about the installation economies and advantages of Republic ELECTRUNITE E.M.T., call your electrical distributor. Or, send coupon on next page today.

Further Proof... The **BEST** Costs **LESS** Installed



EXCLUSIVE "INCH-MARKS" make quick measurements a cinch. Every length of Republic ELECTRUNITE E.M.T. is like a 10-foot rule—marked off from end to end in feet and inches. You avoid the clumsy problem of a flat rule on a round tube . . . eliminate guesswork, save material.



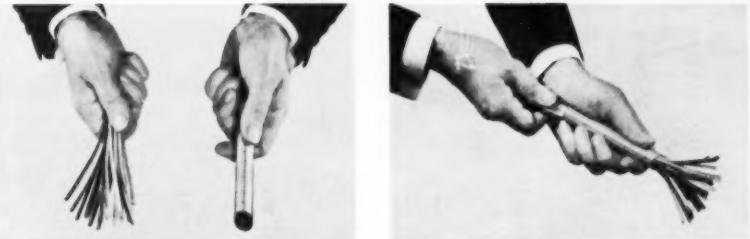
"**GUIDE-LINE**" extends full length of tubing. By properly aligning with calibrations on Republic Bender, bends are kept in correct plane. Avoid costly "wows", wasted time, wasted material. Both "INCH-MARKS" and "GUIDE-LINES" are ELECTRUNITE features on all $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1", and $1\frac{1}{4}$ " sizes.

inside finish



**TRY
THIS TEST!**

DEMONSTRATION...THE BEST COSTS A LESS INSTALLED



Take a sample length of Republic ELECTRUNITE E.M.T. with new SILVERSICK inside finish. Insert a bundle of 25 pipe cleaners. Now, push-pull the pipe cleaners through the tubing.

As many as three Number 12's can be pushed or pulled through $\frac{1}{2}$ " Republic ELECTRUNITE E.M.T. easily. Ask your electrical distributor sales representative to show you this demonstration.

Plus... more Installation Features...



UNIFORM DUCTILITY in every foot of Republic ELECTRUNITE E.M.T. assures smooth, accurate bends every time—with no costly kinks. Welded by the famous Electrunite Process, this quality conduit is 100% Republic—from ore to finished product.



GALVANIZING protects every inch of Republic ELECTRUNITE E.M.T. The special galvanized finish will not chip or flake when tube is bent. And because ELECTRUNITE E.M.T. is threadless, there's no unprotected steel exposed at the joint, no wrench marks to damage the finish. All reasons why . . . the best costs less installed.



UNIFORM CONCENTRICITY assures a truly round tube for snug-fitting connections with no muss, no fuss. To make joints tight, you simply tighten the fitting, not the entire run—a real aid where space is limited. Another reason why . . . the best costs less installed!

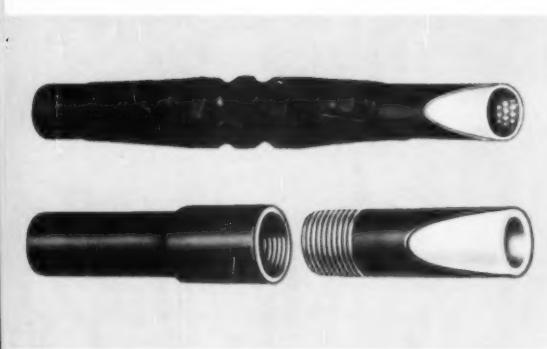
THESE REPUBLIC PRODUCTS MEET EVERY ELECTRICAL CONTRACTOR NEED



REPUBLIC RIGID STEEL CONDUIT

• GALVITE • ENAMELITE

GALVITE® (Blue Label) is hot dipped galvanized inside and out and has a special coat of baked-on lacquer inside and out for further corrosion resistance and long life. ENAMELITE® (Red Label) is protected inside and out with a heavy baked-on coating of tough, wear-resistant enamel which is resistant to acid types of moderately corrosive action. Both types are made from soft, ductile steel and produced by the continuous weld process. Both are thoroughly tested and approved in accordance with national, state and local codes, and carry the Underwriters' Laboratories seal of acceptance.



REPUBLIC "DEKORON-COATED" E.M.T. AND "DEKORON-COATED" RIGID STEEL CONDUIT

Republic "Dekoron®-Coated" E.M.T. is easy to install, requires no special techniques, no special tools, no special fittings. It offers all the installation advantages and built-in qualities of ELECTRUNITE E.M.T. plus remarkable resistance wherever corrosive conditions make short work of standard conduit. Republic "Dekoron-Coated" Rigid Steel Conduit is available where code requirements necessitate the use of heavy wall conduit. Both types are coated with corrosion-resistant polyethylene and provide continuous corrosion-free protection from outlet to outlet.



REPUBLIC BENDING SYSTEM

The Republic Bending System is a fast, mathematically accurate method of making predetermined bends by using the "INCH-MARKED®" and "GUIDE-LINED" features of Republic ELECTRUNITE E.M.T. with the Republic ELECTRUNITE Bender. Stubs, true offsets, saddles, and back-to-back bends are easy to make when you align E.M.T.'s "INCH-MARKS" with the calibrations on the Bending Tool. The full length "GUIDE-LINE" helps to keep bends in the correct plane . . . avoids costly "wows", wasted time, and wasted material. Send for free booklet, S-D, "The Bending System".

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
DEPT. C-6688
212 EAST 131st STREET • CLEVELAND 8, OHIO

Please send additional information on the following:

- Republic ELECTRUNITE E.M.T. with SILVERSICK Finish
- Republic ELECTRUNITE "Dekoron-Coated" E.M.T.
- GALVITE Rigid Conduit Republic Bending System

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

REPUBLIC STEEL STEEL AND TUBES DIVISION



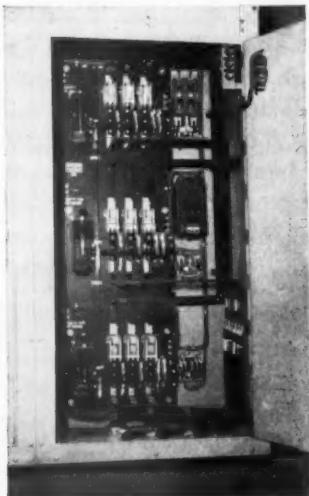
Cleveland 8, Ohio

now... multiple mechanical interlocking extends electrical control design frontiers

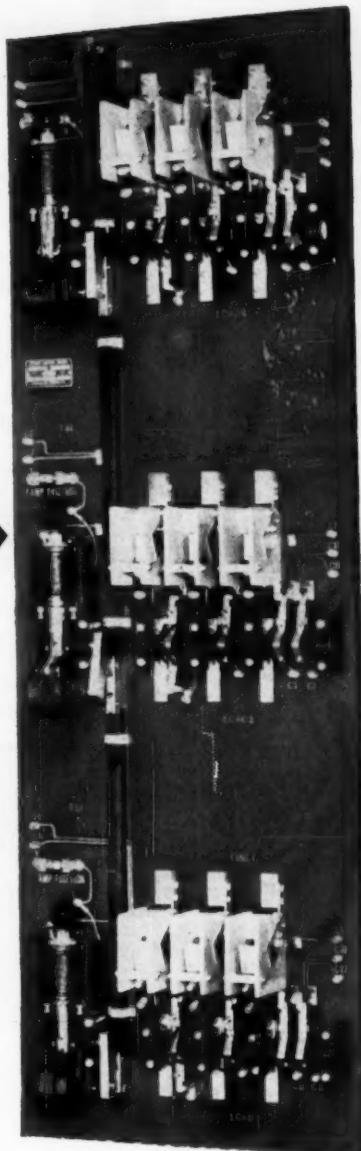
Any Number of Mechanically or Magnetically Held Switches Can Be Mechanically Interlocked . . . Simply and at Low Cost

Mechanical interlocking involving more than two devices has until now been expensive and complicated. Now . . . for simplification and safety in control systems, ASCO provides low cost mechanical interlocking through a simple, effective cable interlock, suitable for controlling any number of switches.

In this installation, three ASCO Mechanically Held Remote Control Switches are mechanically interlocked through a slack cable interlocking system. Closing of any one switch removes slack from aircraft cable connecting the switch shafts, effectively interlocking the remaining switches. Should either of the two remaining switches then be energized, the connecting cable prevents closure.



This application shows ASCO triple interlocked Bulletin 911-163s Remote Control Switches used for switching the primaries of transformers feeding 800, 1000 and 1200 volt fluorescent lighting circuits. On the job in vital areas of New York's Lincoln Tunnel, this system compensates for changes in ambient temperature and for lamp aging.



Dependable Control by ASCO

Write today for catalog 57-52 on ASCO Remote Control Switches—
it is your basic reference on dependable electromagnetic control.

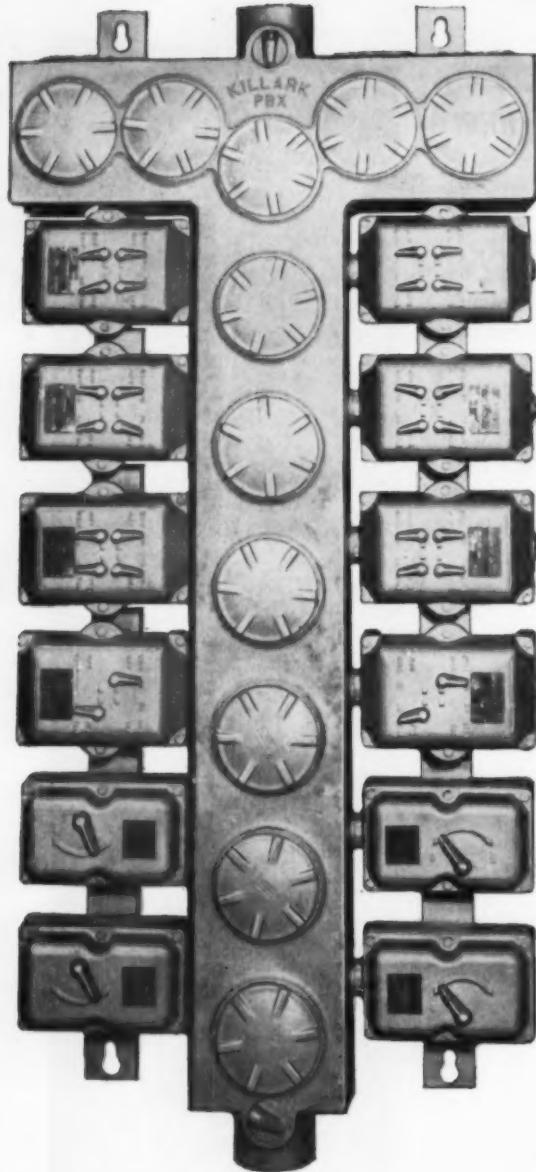
Automatic Switch Co.

50-J Hanover Road, Florham Park, New Jersey • FFrontier 7-4600

AUTOMATIC TRANSFER SWITCHES • SOLENOID VALVES • ELECTROMAGNETIC CONTROL

ASCO®

New Explosion-Proof Aluminum Construction

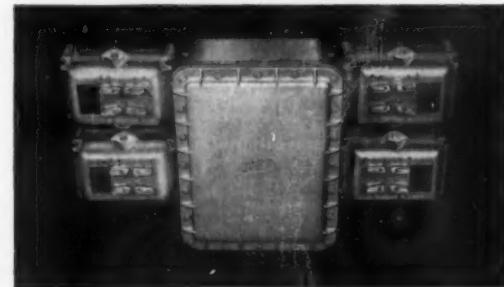


EXPLOSION-PROOF PANEL BOARDS

Now available from Killark! Made to your "specs," completely wired, ready to install. We'll include the breaker of your choice. Available in either screw-cover or bolt-on cover types, in rectangular or "T" style wiring trough. Cast aluminum for rugged, light weight and smooth, safe operation. Roomy cover openings assure plenty of hand room. All seals and connections are included, as well as mounting brackets.

Explosion-proof PANEL BOARD (screw cover)

Panel illustrated contains 32 circuits: top 3 breaker boxes on each side contain 4 single-pole breakers each, 4th box from top on each side contains 2 double-pole breakers each, bottom 2 on each side contain 1 three-pole breaker each. Comes completely wired. Contractor has only to pull main and take off branch circuits from connection block. Wiring trough is produced in one piece to eliminate sectional joints, increase safety.



Explosion-proof PANEL BOARD (bolt-on cover)

Preferred on some jobs for small panels. Available for hazardous as well as all-weather areas. Hinged cover is another available feature.



Killark

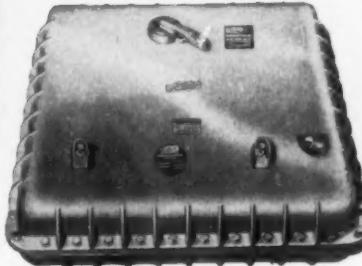
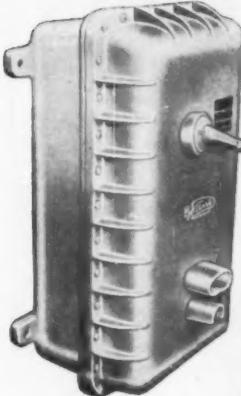
ELECTRIC MANUFACTURING COMPANY

Vandeventer and Easton Aves.

St. Louis 13, Missouri

Items from Killark

...Big in Selection...Big in Safety!



EXPLOSION-PROOF MOTOR STARTER ENCLOSURES

Designed for your next job calling for motor control equipment. Guaranteed to please you. Made of popular lightweight cast alumalloy—strong and carefully machined for ease of operation and long, trouble-free service. We'll include starter of your choice.

XMS SERIES STARTER

Designed to incorporate standard magnetic across-the-line starter equipment including sizes 0, 1, 1½, 2, 3, 4 and 5.

XMCS SERIES COMBINATION STARTER

Available with starters 0 through 5 with protective circuit breaker or disconnect as required.

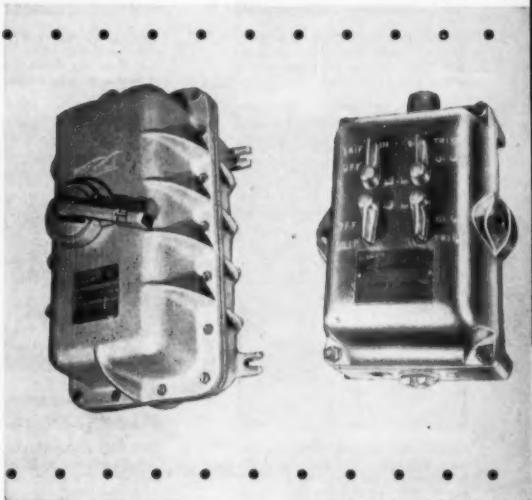
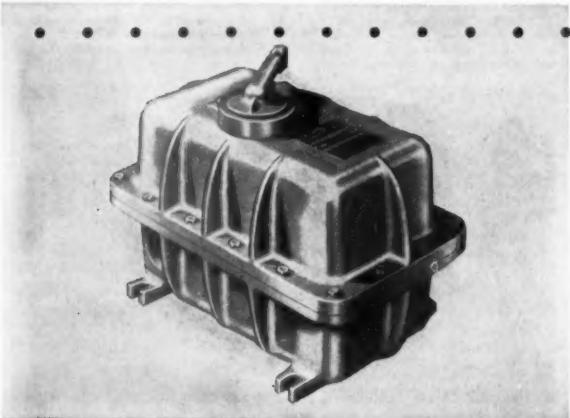
EXPLOSION-PROOF CIRCUIT BREAKER ENCLOSURES

Complete line includes dust-tight and weather-proof as well as explosion-proof breakers. Modern, lightweight cast aluminum. All sizes through "LM" Frame. Easy-action handle assembly for smooth, positive operation. Breakers included.

Modern, lightweight cast aluminum housing that requires no maintenance and meets the most exacting installation needs.

XCB Series Breaker Enclosures—All sizes complete through "LM" Frame. We include breakers. Easy-action handle assures smooth, positive operation. Lockout included.

XPCB Series Breaker Enclosures—Will accommodate 4 single pole "quicklag" type breakers, or 2 double pole, or 1 three pole, or any combination not exceeding 4 poles. Amp. ratings through 70 amp.



EXPLOSION-PROOF DISCONNECT SWITCHES

A long-felt need in the electrical industry will be filled by this complete line of disconnect switches (Series XDS). They are available with or without solid neutral, fuseable and non-fuseable, all with convenient mounting lugs. Constructed of lightweight, non-rusting, non-corroding aluminum, they offer a full range of hub arrangements and conduit sizes.

WE WOULD APPRECIATE THE OPPORTUNITY OF BIDDING ON YOUR NEXT JOB

KILLARK REPRESENTATIVES

ATLANTA 8—Ernest T. Loyd, Inc., 69 Mills St., N.W.
BALTIMORE 27—Eastern Sales Co., 1561 Lister Rd.
BOSTON 7—Electrical Agencies, Inc., 49-51 High St.
BUCKLEY—Eberhardt Electric Sales Co., Johnson St.
CHICAGO 12—Jack R. Rows & Son, 2639 W. Jackson
CINCINNATI 37—Arthur L. Ehlers Co., 1031 Mata
Drive
CLEVELAND 14—Lulty-Thomson Co., 2140 Hamilton
Ave.
DALLAS 2—Geo. E. Anderson Co., 1801 Griffin St.
DENVER 4—Kenneth B. Schuman Co., 1073 Galax
Streets, S.E.

DETROIT 14—Riecher Electric Sales Co., 8310 Mack
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KANSAS CITY 8—Wm. B. Terry Organization, 616
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OMAHA—6118 Gold
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Myers St.
MILWAUKEE 2—Martin-Gaertner Sales Inc., 1108
North Third St.
MINNEAPOLIS 2 — Harry P. Smith Co., 826-27
Andrus Blvd.

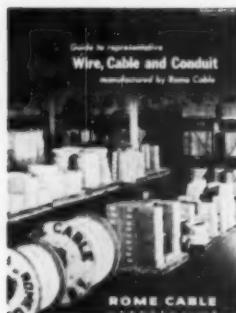
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West 181st St., Room 22
PHILADELPHIA 3—Harry G. Anschutz Co., 113-115
N.W. 23rd St.
PHOENIX—Kenneth Anderson Co., c/o Mr. Melvin C.
Long, 422 S. 7th Ave.
PITTSBURGH 9—Crescent Sales Co., Inc., 4830 Mc-
Knight Road
SAN FRANCISCO 2—M. Nicholas Co., 714 Harrison
St.
SEATTLE 4—Northwestern Agencies, Inc., 4180 First
Ave., South

KEEP UP-TO-DATE ON WIRE AND CABLE WITH THESE ROME CABLE BULLETINS

To find out what's available to make *your* jobs easier...to keep up with modern methods and current trends in the industry...send for any or all of these bulletins.

Read over the brief descriptions below to choose the ones you want, then mail your order to Dept. B40, Rome Cable Corporation, Rome, New York.

ROME CABLE CORPORATION



**GUIDE TO REPRESENTATIVE WIRE,
CABLE AND CONDUIT**
manufactured by Rome Cable
Unfolded, it becomes a
handy wall chart. Free!



CABLE INSTALLATION PRACTICES
—Bulletin RCT-101. Contains Section 8 of the Rome Cable Manual of Technical Information. Price: \$1.

Your chance to get a copy of THE "BIBLE" OF THE INDUSTRY

THE ROME CABLE MANUAL OF TECHNICAL INFORMATION keeps calculations, data, and technical tables always handy. Widely used in the industry, it contains complete information on standard installation practices, properties of materials, conversion tables, communication frequency data, and other general information. Nearly 400 pages! Send for your copy. Only \$4.62 post paid.



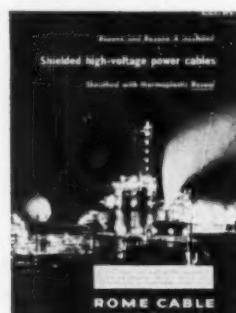
CURRENT TRENDS—Bulletin RCT-100. A series of problem-solving articles reprinted from various trade magazines. Free!



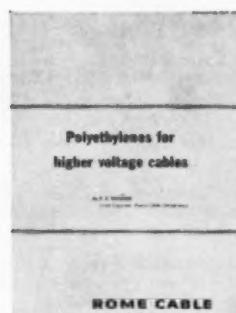
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—Bulletin RCP-361. Contains general information and tables on Rome Service Cables. Free!



INSTRUMENTATION CABLES—Bulletin RCD-400. Details cable for telemetering, data recording, circuit control testing, and electronic computers. Free!



**SHIELDED HIGH-VOLTAGE POWER
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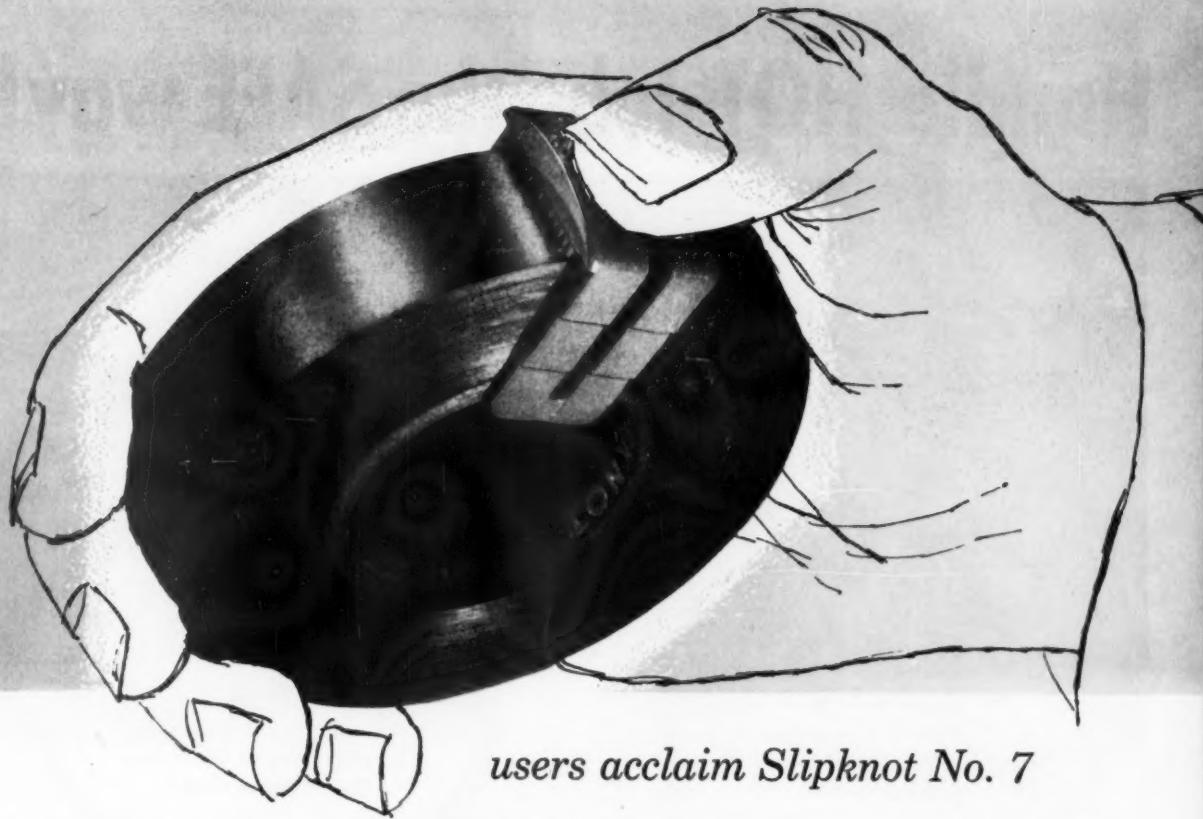
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and here is a cross-section of their comments:

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	"Your tape is very good, and sure sticks where it is put." <i>(Columbus, Kan.)</i>		"Convenient, efficient, makes the tape very easy to work with." <i>(Dunkirk, N.Y.)</i>
	"Works the best and sticks the best in cold weather that I have ever used . . . and I've tried all!" <i>(Newaygo, Mich.)</i>		"Worth its weight in gold!" <i>(Grantsburg, Wis.)</i>
	"Best adhesion I've used so far." <i>(Chestertown, Md.)</i>		"Best thing that could happen to any tape!" <i>(Chicago)</i>
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*Plymouth exclusive, patented

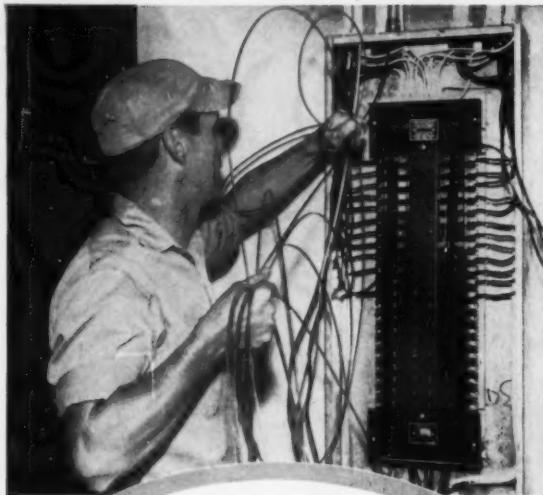


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Invented by experienced electricians . . . in use by thousands of contractors!

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There's no need to worry about hot panels when you use a Jet Line Gun . . . because the need for fish tape and snaking is eliminated!

A small jet-propelled cartridge does the trick! Launched by the Jet Line Gun, in seconds it twists around ells and bends, up and down as it lays a nylon line in the conduit . . . draw polyethylene rope through and you're ready to pull wire in minutes, not hours . . . safely!

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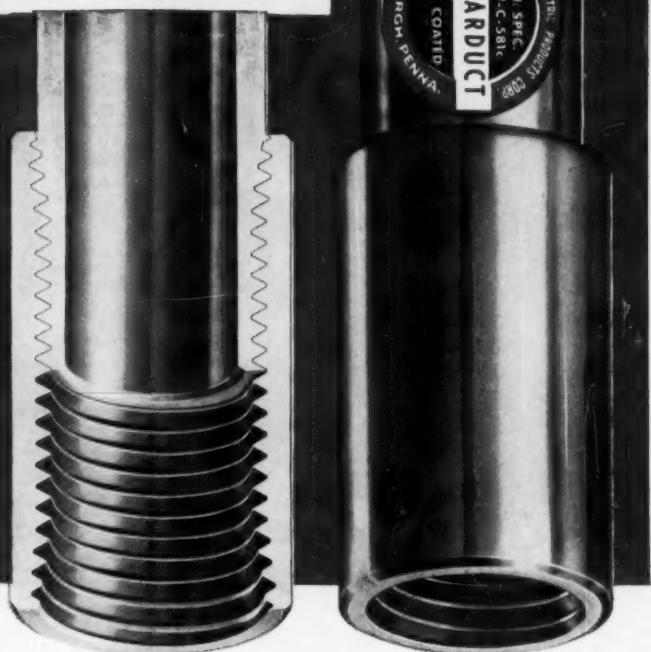
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2. Not just galvanized, but alloy-galvanized.
3. "Exclusive" new MVC-1 vinyl coating.
4. Time-saving, money-saving—easiest bending of conduit . . . easy to work into j.b.
5. End to end protection.
6. Easy fishing.



LIFETIME PROTECTION: SHERARDUCT will not rust or corrode—wiring is protected for life. Once installed, this conduit is there as long as the building stands.

ALLOY-GALVANIZED: The Sherardizing process of galvanizing actually *alloys* zinc to steel for *deep down protection*. A coating results that will not chip or flake off.

MVC-1 . . . SUPERIOR INTERIOR AND EXTERIOR PROTECTION: In every test—accelerated salt spray, sulfuric acid and caustic—SHERARDUCT with MVC-1 showed up far superior to all other types of conduit tested.

TIME-SAVING, MONEY-SAVING: Top quality pipe and unusual ductility (slow heating-cooling process normalizes

steel) provide the answer. Easy to work, thread, install, SHERARDUCT bends quickly to fit any job . . . without spring-back . . . without flaking or cracking—saving time and saving money.

END TO END PROTECTION: Raw, exposed threads are a thing of the past. Threads of both conduit and coupling are precision cut *before* alloy-galvanizing, giving every peak, every valley uniform deep down protection.

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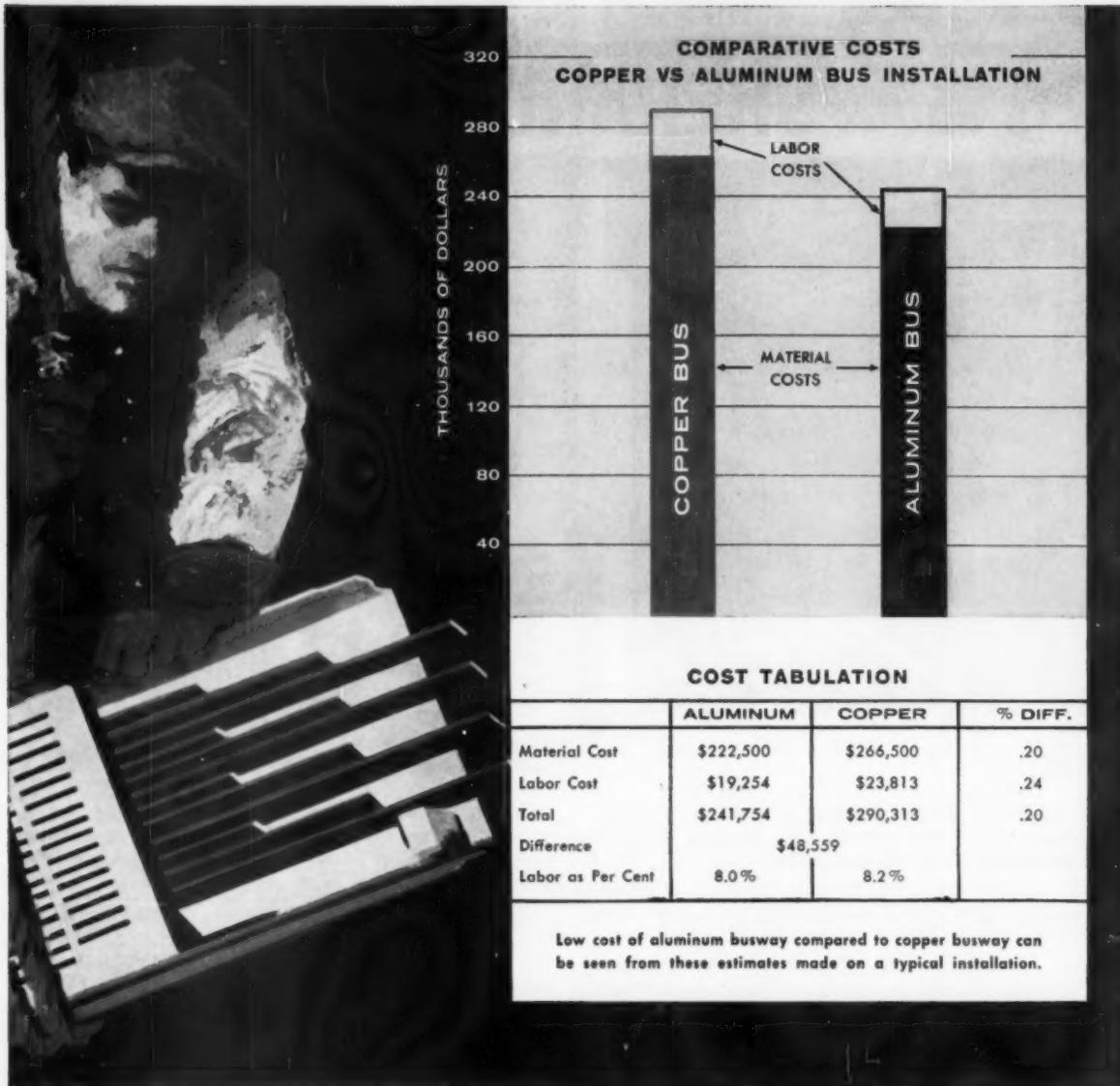
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SUPERIOR ENCLOSURE CONSTRUCTION



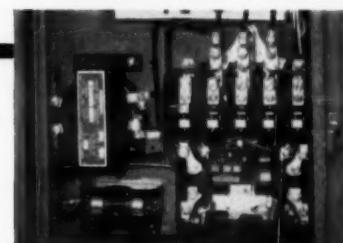
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Easy-to-change, silver cadmium contacts...contact assembly rides on ball bearings...operating coil easily accessible...flexible coil leads...bi-metallic overload relay for manual or automatic resetting.

FEDERAL  **PACIFIC**

The Best in Electrical Distribution and Control Equipment

PLANT SAVES \$16,483.37 IN MATERIAL COSTS WITH CONVERSION TO ALUMINUM BUILDING WIRE

The figures in the chart at right were prepared recently as an actual estimate for conversion to aluminum primary and secondary feeders and branch circuits in a strip and sheet mill.

\$16,483.37 saved in materials . . . and this is not an unusual saving! It is typical of the savings available to contractors and industrial users with KW Aluminum Building Wire.

Easy To Work As Copper

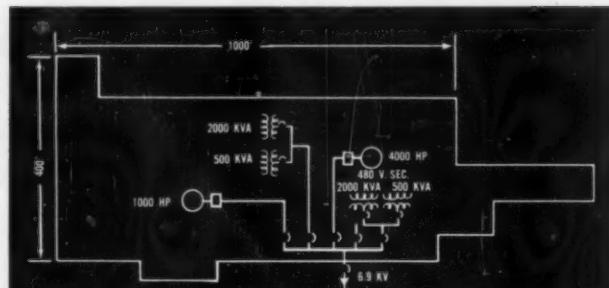
Besides big savings, KW Aluminum Building Wire offers you many more important advantages over copper: Lighter weight for easier handling and installation . . . Greater flexibility for easier bending, forming, cutting and training . . . Cooler operation based on equal conductivity . . . and more.

To bring contractors and industrial users greater cable values than ever before, KW combines the knowledge of two great plants. One, at Newark, Ohio, has pioneered the development of aluminum conductors; the other, at Bristol, Rhode Island (formerly U. S. Rubber Wire and Cable Division), offers 68 years experience as "the masters of insulation." KW offers you a wide range of insulations.

Conversion Estimating Service

To give you practical assistance in applying the advantages of aluminum to your jobs, KW will provide, at no obligation, the services of the new "Aluminum Conversion Estimating Group." Please arrange this service through the KW Sales Representative at the Kaiser Aluminum Sales Office listed in your telephone directory.

Kaiser Aluminum & Chemical Sales, Inc., Executive Office, Kaiser Bldg., Oakland 12, Calif.; General Sales Office, Palmolive Bldg., Chicago 11, Ill.



Typical Cost Comparison — Aluminum vs. Copper

LARGE INDUSTRIAL PLANT 350,000 Sq. Ft.

Summary of Material and Cost Date Rec'd. 6/25/58
Aluminum Conversion Estimating Service Date Ret'd. 7/ 6/58

	Wire	Conduit	Total	% SAVINGS
Aluminum Cost	\$47,964.44	\$12,860.64	\$60,825.08	
Copper Cost	64,876.76	12,431.69	77,308.45	
Difference	\$16,912.32	\$ -428.95	\$16,483.37	21

This estimate is for:	Voltage	Type Wire
(X) Primary Feeders	6900	7.5 KV Butyl-Neoprene, Shielded
(X) Secondary Feeders	480	RH-RW
(X) Branch Circuits	120	RH-RW

ALUMINUM WIRING			COPPER WIRING	
Wire Size	Total Wire In Feet	Total Wire Cost	Total Wire In Feet	Total Wire Cost
12	111,526	\$ 3,513.07	111,526	\$ 4,862.53
10	720	28.80	1,755	98.28
8	1,035	52.79	2,775	242.54
6	2,775	222.00	22,635	2,648.30
4	22,635	2,037.15		
2			400	88.40
0	400	68.00	6,930	2,730.40
00			12,375	7,375.50
0000	6,930	2,113.65		
300	12,375	5,717.25	35,053	46,830.81
500				
700	35,053	34,211.73		
		TOTAL \$47,964.44		TOTAL \$64,876.76

Conduit Size	Total Conduit In Feet	Total Conduit Cost	Total Conduit In Feet	Total Conduit Cost
3/4	33,008	\$ 6,931.68	33,638	\$ 7,063.98
1	2,453	735.90	2,468	740.40
1 1/4	1,239	483.21	654	255.06
1 1/2	265	121.90	200	92.00
3	770	970.20	980	1,234.80
3 1/2	360	594.00		
4 Fiber	9,395	2,912.45	9,465	2,934.15
5 Fiber	210	111.30	210	111.30
		TOTAL \$12,860.64		TOTAL \$12,431.89



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NEW

AIM
BRAND

SLOTTED ANGLE

another
Acme
Idea
Material



cuts job costs up to 40%

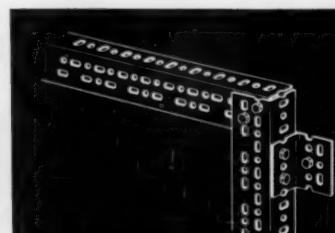
Now, save on initial cost of installation material. Save handling when sizing or cutting. Save on-the-job fabrication time. With these savings you can cut job costs up to 40% on every electrical installation.

Versatile, adaptable AIM Brand Slotted Angle can be used as framing, supports, mountings or in countless other ways. The recurring pattern of slots and holes is precisely engineered to allow easy, convenient structural assembly or apparatus attachment. All standard electrical fittings adapt to $\frac{3}{8}$ " holes. And $\frac{3}{8}$ " AIM Brand structural bolts, with full-load shoulders, have 2000 pound safe-load capacity. AIM Brand Slotted Angle is cold-rolled for maximum

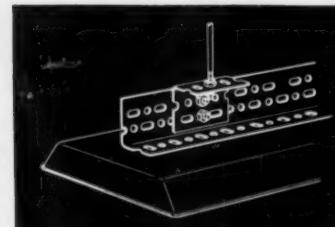
strength, galvanized for rust resistance. Two sizes: Standard, $2\frac{1}{4}'' \times 1\frac{1}{2}'' \times .080''$ and Heavy-duty, $3'' \times 1\frac{1}{2}'' \times .104''$.

Only two tools needed to work it on-the-job: AIM Brand Cutter and a hand or power wrench. Easy to handle, store or inventory. New AIM Brand Slotted Angle is available nationally. Get it through your local distributor.

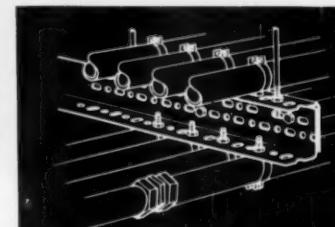
For a FREE book about AIM Brand Slotted Angle, write Dept. EBD-128, Fabricated Materials Division, Acme Steel Company, Chicago 27, Illinois. This booklet shows the many ways you can use this new material and tells about all its advantages.



Useful! Pieces from 3" to 6" in length made from end cut-offs can be bolted against a wall and used as mountings for frames built from AIM Brand Slotted Angle.



Versatile! Another way to use 3" to 6" lengths of AIM Brand Slotted Angle is to bolt to fluorescent fixture support, making it easier and simpler to level entire fixture.



Adaptable! Only with Acme Steel AIM Brand Slotted Angle is a trapeze support for conduit made so simply. A single, short section of slotted angle is bolted to ceiling rods. Conduits are attached to the support with hangers. Another length of slotted angle bolted to the first allows running conduit underneath as well.

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STEEL

AIM Brand Slotted Angle

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**INTERLOCKED
ARMORED CABLE**

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Modernizing Old Plants**

For more current capacity than cable in conduit or other armored cable, specify and buy Rockbestos A.V.C. . . . for easy installation on racks or hangers beneath the ceiling or next to walls, specify and buy Rockbestos A.V.C. . . .

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New RIDGID No. 450 Portable Tristand Chain Vise



has Large Easy-to-Operate

Top Screw
Handle
right up on top

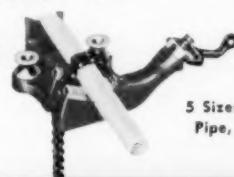
Capacity, $\frac{1}{8}$ " to 5"
Weight, 42 $\frac{1}{2}$ Lbs.

Here's a real time saver. Not only do you get a complete work-bench that's truly portable, but now you get a chain vise that's extra easy and fast to operate. Handle is right up on top where it's always handy. Handle and tightening nut are anchored to vise base . . . can't pull out.

Vise base, that overhangs front legs for clear tool swing, has hanger slots for tools, 3-size pipe bender, rear pipe rest and adjustable ceiling brace screw. Folding legs and integral tray set up easily and lock in position for rigid work base. Snap chain holds folded legs closed for easy carrying . . . no loose parts. Rubber grommets in tristand feet prevent creeping. See and try this more-for-your-money RIDGID Top Screw Chain Vise at your Supply House!

New RIDGID Bench Chain Vises

have same Extra-Efficient
Top-Screw Adjustment . . .

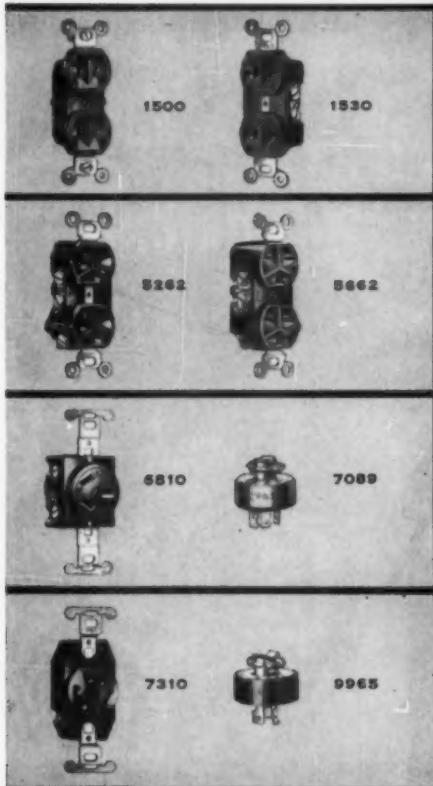
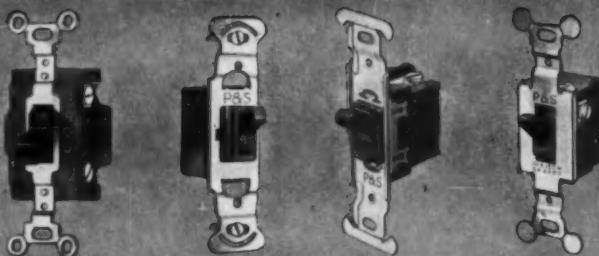


5 Sizes, for $\frac{1}{8}$ " to 8"
Pipe, Conduit or Rod

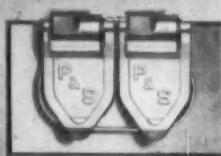
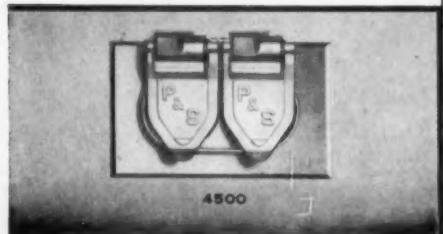
For more information on the RIDGID line of tools and accessories, write to: RIDGID DIVISION, THE FISCHER CO., 1000 N. May St., Kansas City 10, Mo.

THERE'S A P&S QUALITY WIRING DEVICE FOR EVERY REQUIREMENT

SWITCHES — A complete line . . . heavy duty 20 Amp AC . . . T-Rated . . . residential . . . a switch for every job.



DESPARD LINE — The original and only complete interchangeable line . . . super-compact, highly versatile. Combinations assemble in seconds with P&S-Despard camstrap.



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OUTLETS — A range to meet every need. Shown are the 1500 with time-saving screwless terminals and the 1530 T-Slot with dead back.

3-WIRE GROUNDING DEVICES — A full line of outlets, caps, connectors in 125 V and 250 V types.

POLARIZED DEVICES — Available in 2, 3, and 4-wire . . . 15 and 20 Amps . . . outlets, caps and connectors . . . all built to take a beating.

TURNLOK — Sturdily built outlets, caps, connectors . . . 2, 3, and 4-wire, 10 and 20 Amps.



WEATHERPROOF COVER — Makes any standard duplex outlet a weatherproof device.



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Aluminum Conduit

Early in 1958 a new price schedule on rigid aluminum conduit brought the cost of the light metal product down to about 20 percent more than steel. At the time the event attracted little attention. Aluminum conduit has been long regarded as a useful specialty with many favorable features. The new prices were more attractive but still substantially higher than steel and, considering the cost of the basic metal, certain to remain so.

A premium product, however attractive, would hardly account for the lively interest shown by electrical contractors in aluminum conduit at the NECA trade show in Dallas last month. What the contractors were appraising was the effect on the labor column. A length of aluminum conduit weighs only one third as much as an equivalent length of steel conduit. And, as experienced estimators know, unit installation labor costs, particularly in the larger sizes, are a function of weight.

Relatively few electrical contractors have much actual job experience with aluminum conduit, but those who have concede that the labor saving is substantial. A report recently prepared by a leading firm of consulting engineers for an aluminum producer concludes that for 1½-inch and larger sizes, at a 20 percent premium material cost and at prevailing labor rates, the installed cost of aluminum conduit is already competitive.

At precisely what labor rate the installed costs of aluminum and steel cross is anybody's guess. While the industry uses unit labor data as though they were exact costs, they are, of course, only approximations. But the continued upward trend in labor rates would make such a cross-over inevitable in any case. The handling and installation of large feeder conduits, traditionally one of the heaviest and most laborious tasks performed by electricians, are spectacularly easier with aluminum.

While installed costs are always debatable, there are significant indications that aluminum conduit is moving out of the specialty class and into a competitive position for general use. The crucial test of that position, however, will be how many contractors, given a specification option, elect to use the light metal on their own initiative and practical knowledge of installation costs.

Wm. T. Stuart

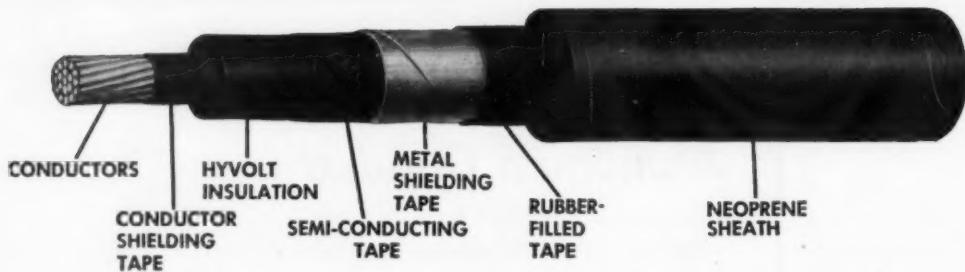


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For More Amperes Per Dollar of Installed Cost

ADVANTAGES

1. Long life
2. Can be operated at 85°C. Permits smaller conductors or more amperes per conductor.
3. Freedom from corona cutting
4. Excellent resistance to moisture
5. Low power factor and dielectric loss
6. Lighter, more flexible, easier to handle and install than lead covered cables
7. Electrolytic or chemical corrosion of lead sheath is eliminated by use of neoprene sheath
8. Shielding prevents possibility of surface burning and provides safety to human life.

CRESCE NT HYVOLT insulation is made from butyl rubber which is inherently resistant to ozone, heat, moisture and aging. HYVOLT is formulated and processed so as to retain these inherent characteristics of the butyl rubber and at the same time provide excellent electrical and physical properties.

The insulation is protected during and after installation by an outer neoprene sheath providing a maximum degree of toughness, durability and long life. It is flame retarding and resistant to the deteriorating effects of moisture, sunlight, ozone (corona), oil, grease, and many acids and alkalies.

HYVOLT Shielding provides additional internal and external protection in these THREE WAYS

1. Conductor shielding, as provided by a semi-conducting tape over the stranded conductors, excludes air pockets between conductor and insulation and eliminates possible internal corona-cutting of the insulation.
2. The semi-conducting tape between the insulation and metallic shielding tape prevents possible ionization of air spaces and corona at the insulation surface.
3. The metallic shielding tape is grounded when installed, resulting in zero potential to ground at the sheath. It prevents surface discharge or burning, and protects cable from lighting surges. Reduces shock hazard.

RECOMMENDATIONS

CRESCE NT SHIELDED HYVOLT CABLE is recommended for use in conduits, underground ducts, in wet or dry locations, or buried directly in the ground, for circuits operated at over 3000 volts and in accordance with I.P.C.E.A. recommendations. Available in single conductor or multi-conductor cables.

Specify CRESCE NT SHIELDED HYVOLT POWER CABLE for general power circuits and where severe conditions are prevalent such as chemical plants, refineries, paper mills, mines, sewage disposal plants, etc. It is approved as Airport Lighting Cable Type B, CAA Specification L-824.

SEND FOR BULLETIN

CRESCE NT INSULATED WIRE & CABLE CO.

TRENTON 5, N. J.

Lighting Ford's New General Office Building



Careful design and installation provides integrated, flexible lighting for almost half million square feet of office space in new building housing the executive staff of Ford Motor Company's Ford Division.

By Nelson A. Kieb, Assistant Chief Electrical Engineer
Albert Kahn Associated Architects and Engineers, Inc., Detroit, Mich.

OFFICE layout can be changed without disturbing the general lighting on any floor of Ford Motor Company's Ford Division's new 5-story general office building in Dearborn, Mich. Such operational flexibility was a prime consideration in the architectural, structural and mechanical facilities design of the building enclosing almost a half-million square feet of floor space. In addition, the lighting system was planned to provide, at the most economical cost, moderate, comfortable illumination intensities ranging from

50 footcandles in the smallest (10 ft by 12 ft) to 80 footcandles in the largest (120 ft by 120 ft) office spaces.

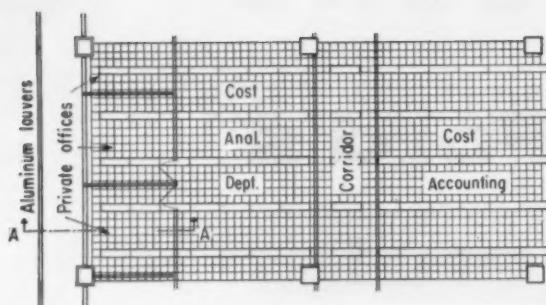
The project design is the result of a joint operation by Albert Kahn Associated Architects and Engineers of Detroit, and Wilton Becket and Associates of Los Angeles. The building was constructed by Bryant & Detwiler, general contractors, Detroit. Electrical installation was by Triangle Electric Company, Detroit, electrical contractors.

A number of layout and instal-

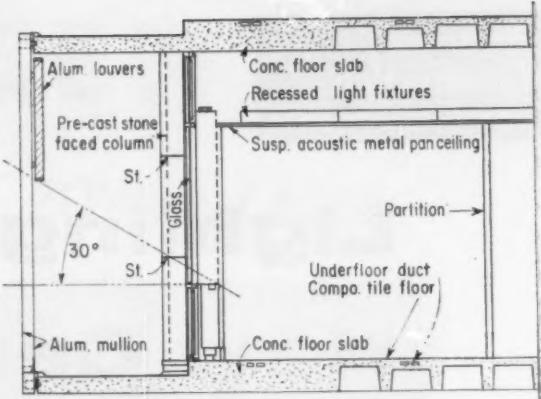
lation problems were encountered in meeting the prescribed lighting design requirements of specific building areas. How some of these were solved is explained and illustrated in the succeeding pages.

General Lighting Layout

Installation of movable partitions and a high degree of flexibility in future partition relocation without disturbing the general lighting had an important bearing on system layout and equipment choice. After considerable study,



TYPICAL BAY PLAN showing lateral rows of continuous fluorescent troffers on 6-ft centers to facilitate modular office layout. Troffers can be added at corridor breaks if layout is changed.



SECTION THROUGH BAY at exterior wall. Note floor slab overhang to support mullions and louvers to control natural light; also inside partition crossing recessed troffers with lay-in lenses.

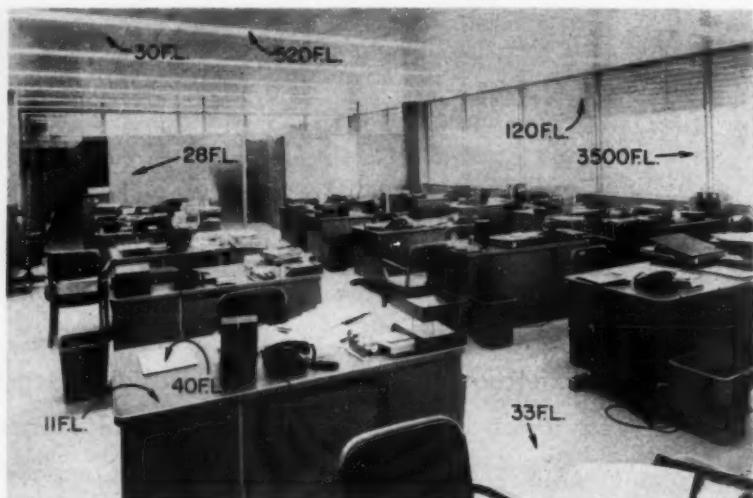
2-lamp, 48-in. fluorescent troffers were selected for general lighting. Each unit contains two 40-watt rapid start fluorescent lamps enclosed with low-brightness glass lay-in lenses. The luminaires are recessed in the suspended metal acoustical tile ceiling in continuous rows paralleled on 6-ft centers across the width of the building.

The lighting is integrated with the heating and air conditioning so that partitions may be installed on 6-ft centers (or multiples thereof) perpendicular to the length of the building. Partitions perpendicular to the building width (right angles to troffer lines) can be installed on any centers since they cross the fixture rows. Since most of the partitions are ceiling height, lay-in troffer lenses—rather than hinged type—were employed to facilitate lamp renewal and fixture maintenance.

Lines of continuous recessed fixtures are broken only at the corridors. Here, in-line spacing between fixtures is rigidly held to 12 ft plus. If the corridor partitions should be removed to provide a large open office space, three additional recessed fixtures may be installed to complete the continuous row pattern with a minimum of difficulty.

Office Corridors

Maintenance of the 12 ft of space in the continuous rows of fixtures at the corridors created a very distinct problem along the partitions enclosing the "inside" offices. Because of the 4-ft multiple, a row



GENERAL OFFICE view taken during normal operating day. Brightness readings indicate illumination control is within recommended limits, eliminating need for drapes, screens and venetian shades.

of fixtures had to terminate either 3 ft inside the partition or extend 1-ft out into the corridor. Three feet of unlighted space in the offices along the partition would create an undesirable condition, and the use of a 2-ft or 3-ft fixture had many disadvantages.

Our solution was to allow 1 ft of the 4-ft fixtures to extend into the corridor. Each extended fixture area was covered with a 1-ft square piece of metal acoustical tile snapped over the fixture, with a piece of heavy brown paper in the bottom to prevent light leak and to simulate the appearance of the adjacent tiles. All fixtures were installed with their bottom surface slightly above the bottom surface of the metal

tile. This permitted the tile to fit over the fixture without extending below the ceiling. The joint between the raw edge of the tile and the fixture is covered by the top edge of the partition.

Corridor fixtures are surface-mounted fluorescent units with one 40-watt rapid start tube enclosed in a diffusing plastic shield. They are spaced 6 ft on centers and wired with flexible conduit to a junction box above the suspended ceiling. The box is located to permit future installation of matching recessed troffers (with office units) without disturbing the remaining corridor lighting, should a part of the corridor be converted to office space. Present corridor lighting is ap-

proximately 15 footcandle insensity and provides a pleasant contrast to the recessed general office lighting.

Lobby, Core Areas

Among several areas throughout the building lighted by luminous louvered ceilings are the lobby, core areas and special corridors. Here, relatively shallow cavities (12 in.) between louvers and ceiling above required a maximum 18-in. spacing between continuous rows of fluorescent tubes.

Careful investigation of lighting intensity and brightness led to the use of F48T12 cool white slimline tubes operated at 200 ma from special ballasts. If standard rapid start tubes were installed in such a design, an intensity approaching 180 footcandles—unwarranted in such areas—would have resulted. Operating the tubes at such low brilliance provides a secondary advantage: lamp life is very materially increased and resultant maintenance decreased.

The plastic louvered ceiling consists of $\frac{1}{2}$ in. by $\frac{1}{2}$ in. by $\frac{1}{8}$ in. deep louvers in 2-ft by 4-ft panels resting on inverted aluminum teebar supports. Since plastic louvers have practically no sound-absorbing characteristics, the ceiling above was covered with metal acoustical tile to avoid noisy and echoing core areas.

This installation proved very effective, providing approximately 50 footcandles of illumination from a uniformly lighted plastic louvered ceiling.

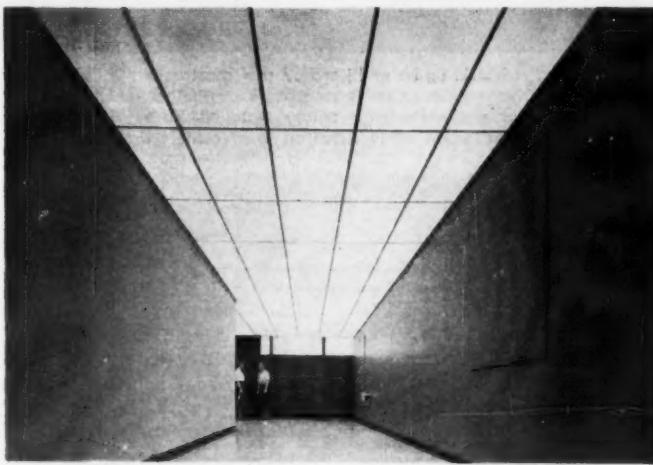
Arched Cafeteria

A unique lighting problem was posed by the multi-arched roof design of the cafeteria dining section. The axis of the arches runs east to west. Each arch spans 30 ft with columns on 30-ft centers both ways supporting the valleys. Running perpendicular to the arches, and directly below the valleys, are horizontal beams along each north to south row of columns. Each beam is enlarged to contain the necessary air conditioning ducts having a cross-section approximately 18 in. high by 11 ft wide centered on the column lines. The underside of this enlarged beam is approximately 12 ft above the floor. Distance from the floor to the underside of the top of the arches is 21 ft.

This room was to be lighted from luminous louvered ceilings under



PRIVATE OFFICE on outside wall shows quality of combined natural and artificial lighting. Note inside partition (right) crossing continuous row troffers. Lighting design permits modular relocation of partitions.



PLASTIC LOUVERED CEILING, with 42° shielding, provides 50 footcandles in main lobby. Standard cool white slimline lamps on 18-in. centers in 12-in. cavity above are operated at 200 millamps to control brightness.



LOW-CEILING of four cross-corridors containing ventilating ducts on each floor have low-brightness, plastic-louvered ceiling illumination similar to lobby area.



DINING AREA and cafeteria under multi-arched roof construction is lighted by combination of recessed glass-enclosed troffers on beam centerline flanked by 4-ft wide continuous "strips" of plastic-louvered ceiling installed in 6½-in. cavity under ventilating ducts. Deluxe warm white tubes on 8-in. centers are operated at 200 milliamps.

the beams, but not more than 6½ in. of cavity could be allowed for the lighting. In addition, with beam center lines 30 ft apart, there were spaces between beams 19 ft wide and the length of the room that would have no source of light from above. All light would have to emanate from the underside of the beams only 12 ft above the floor.

Our solution was to provide two 4-ft wide continuous strips of luminous louvered ceiling under beam with a 3-ft space between centered on the beam. The luminous ceiling is lighted by single F48T12 deluxe warm white slimline lamps operated at 200 ma. They are installed 8 in. apart and perpendicular to the beam. In the space between the plastic louvered ceiling panels a single row of 18-in. wide continuous fluorescent fixtures is recessed between columns. These have two slimline lamps operating at 200 ma and are equipped with hinged flat albalite glass panels.

To permit addition of future ceiling lighting between the beams, a 1500-watt capacity capped outlet was provided in the arched roof in the center of each bay. These were found to be unnecessary.

Lighting under the beams measures approximately 70 footcandles and diminishes to 15 between the

beams. With light colored tables and pastel tinted chairs in place, the difference is noticeable only by critical scrutiny. The blue-gray painted, rough, acoustic-plastered ceiling is lighted by reflection to an attractive shadowy mystery that blends well with the decor of this unusual room.

Conference Room

The 5th floor executive conference room has a luminous louvered ceiling with provision for dimming from the slide projection booth at the rear of the room. Here, rapid start tubes are spaced on 18-in. centers in the 12-in. cavity and are operated from special dimming ballasts and a manually-controlled auto-transformer dimmer. During slide sessions the lighting level is reduced to approximately 10% of normal during projection. This allows slides to be visible on the screen at the front of the room while still providing sufficient light for making and reading notes.

Auditorium

The auditorium for special sales meetings has a stage provision for closed-circuit colored television to dealers across the country. Since stage lighting requirements will

vary from one meeting to another, the stage was provided with standard border and footlights. These are operated with the auditorium ceiling by dimmers remotely controlled both from the stage and projection booth by means of special dimming switches.

In addition, stage pockets in the floor around a central motorized turntable provide an additional 30 kw of capacity at 110 volts for portable stage lights if required.

Auditorium ceiling lighting consists of recessed downlights having 45° cutoff and 150-watt projector spots spaced to give a maximum intensity of 25 footcandles.

Exterior Lighting

Building exterior is a combination of white quartz pre-cast stone panels, aluminum sash, gold anodized aluminum louvers across the top half of each floor, and grey tan porcelain enamel aluminum panels above and below each window. This is strikingly floodlighted to a level of approximately 9 footcandles on the north and east sides which face Rotunda Drive and Southfield Expressway respectively.

The roof fan room conceals the air conditioning cooling towers. The enclosing walls are set back 30 ft from each side of the building and have a screen wall, on each of the four sides, extending out 6 ft from the true wall. The screen wall is made up of narrow vertical panels of porcelain enamel spaced a few inches apart. Continuous lighting at the top and bottom of this wall is provided by F96T12 slimline tubes in weatherproof fixtures with asymmetric reflectors. The exterior true wall illumination is reflected through the spaces between the panels to provide a simulated halo of light around the top of the building.

Roadway lighting is provided by 400-watt mercury prismatic luminaires pendant from 24-ft poles with 6-ft arms and Thompson hangers for maintenance ease. Distribution to the poles is at 480 volts from contactors in the building controlled from the clock program system.

Flexible Distribution

Underground 13,800-volt electric service for the building is supplied by two circuits from the Ford Motor Company distribution point in the Engineering Section on

Oakman Blvd. Primary switchgear and all transformers, except one, are located in one basement room. Each substation for both power and light has two transformers. There are two lighting and one power substations, each with two transformers fed from separate primary buses, and secondary switchgear which contains two main breakers and a tie breaker. The power substation serves centralized motor control centers and power panels for scattered loads.

One section of the power substation in the roof fan room is connected by a secondary cable bus to the other section in the basement where most of the pump and boiler equipment is located.

Building lighting is served by 208/120-volt, 3-phase, 4-wire, busways fed directly from the main breakers in the secondary lighting switchgear. These busways rise through the "core areas," at the quarter points of the building, and are tapped in the electric closets on

each floor. Here, distribution panels feed the floor lighting panels. Panels are located as near as possible to their respective loads. Most are set flush in permanent masonry walls within the core areas.

The dual primary feeders and double transformers with main and tie breakers permit continued operation if one primary feeder or one transformer in any substation is "lost". This is possible because load can readily be switched to the unaffected equipment. Transformers are loaded to not more than 70% of capacity, and with some reduction in load, could continue to serve the largest part of the connected load.

One single-ended substation in the basement feeds the two 600-hp air conditioning compressors at 2300 volts.

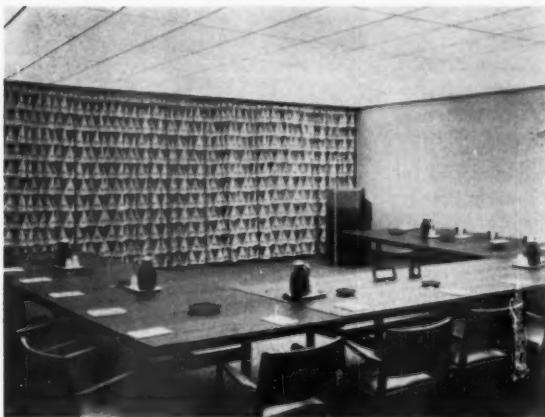
Total system transformer capacity is 6000 kva feeding approximately 500,000 sq ft of office area.

A double duct underfloor system provides 110-volt and telephone

outlets at any desk on all office floors. The dual runs of duct are approximately 6 ft on centers and run lengthwise of the building. Cross headers are run adjacent to lighting panels approximately 60 ft on centers and connect to the longitudinal runs in junction boxes. Ducts are turned up into lighting panels and telephone closets. Many conduits to panels and closets provide supplementary raceways.

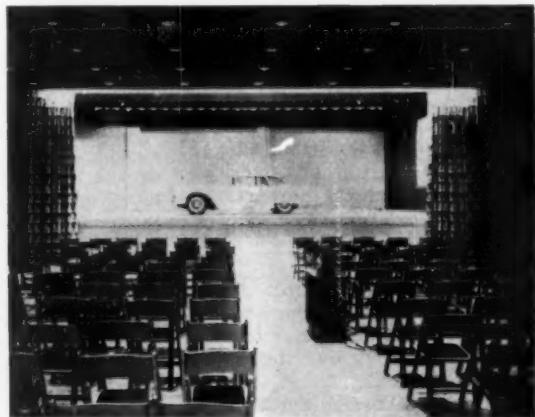
A very important feature of the electrical system design was the unobtrusive location of the electric and telephone closets for the distribution of lighting and telephone service through the building. Each closet is approximately 5 ft by 9 ft. There are two per floor for lighting and four for telephone.

A fire alarm and watchman's system has manual boxes at all floor exits and automatic panels actuated by flow alarms on sprinkler risers. Alarms from all fire and watch boxes are recorded at a master deck.



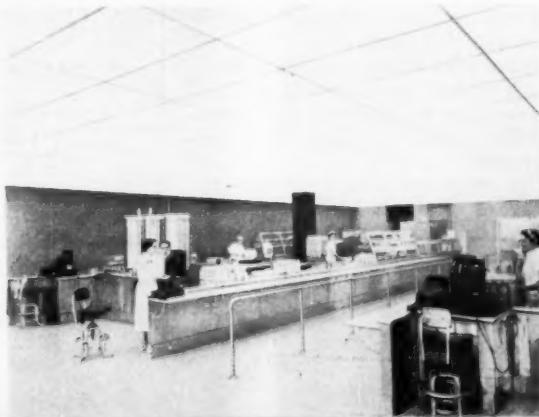
DIMMER CONTROL on executive conference room lighting varies uniform intensity from 6 footcandles for note-taking during slide projection to 100 footcandles for viewing displays. Louvered 10-ft ceiling has 40-watt cool white rapid start lamps with 40° shielding.

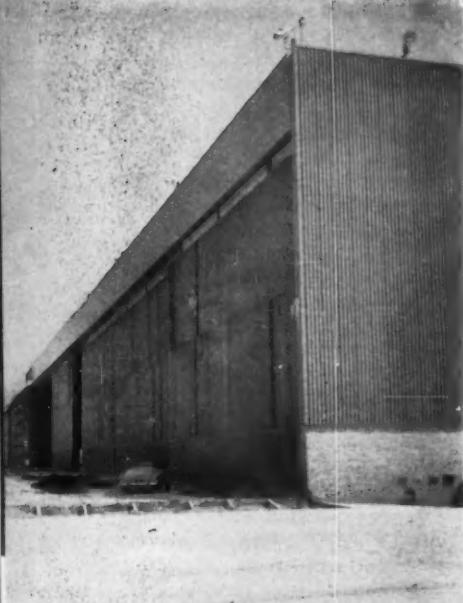
RECESSED DOWN-LIGHTS with 45° shielding baffles and 150W PAR-38 lamps provide uniform lighting in executive dining room. Some units are built into anemostats.



AUDITORIUM LIGHTING, for special sales meetings, consists of recessed baffled down-lights (150W PAR-38 lamps) on 6-ft centers with conventional stage tri-color border and footlights. An additional 30 kilowatts capacity is provided by nine stage-pocket receptacles for closed-circuit color television use.

COLOR TONE control in cafeteria serving area is provided by rows of deluxe warm white fluorescent lamps operated at 200 milliamps above plastic louvered ceiling.





Hangar for jet airliners boasts . . .

600-KVA, 400-Cycle Distribution

A complete 400-cycle distribution layout for servicing jet airplanes is part of the overall electrical system in American Airlines' new hangar at New York International Airport. Clifton E. Smith, partner of Jaros, Baum and Bolles, engineered the design. Lord Electric Company Inc. made the installation.

JET HANGAR is a long, high bay building with space for five giant jet airliners side-by-side behind the sliding doors shown along one side and the same space for five more planes on the other side.

SPECIAL hi-cycle distribution for supplying airplane electrical systems is an important part of overall electrification at American Airlines' new hangar for jets at New York International Airport. Here, the 400-cycle system is actually a sub-distribution layout supplied from a 480/277-volt, 3-phase, 4-wire feeder system serving extensive power and lighting load concentrations throughout the building.

The basic electrical layout is radial, with the service and main distribution facilities at one end of the building, which is a long rectangle in plan and elevation. The building is designed to house and provide for servicing of ten of the new giant commercial jet airliners. In use, it can accommodate five planes, side-by-side, on each side of the three-level core running through the center of the building. This core houses office areas. The long area on each side of the core is hi-bay and is supplied by electrical feeder circuits carried through the core structure.

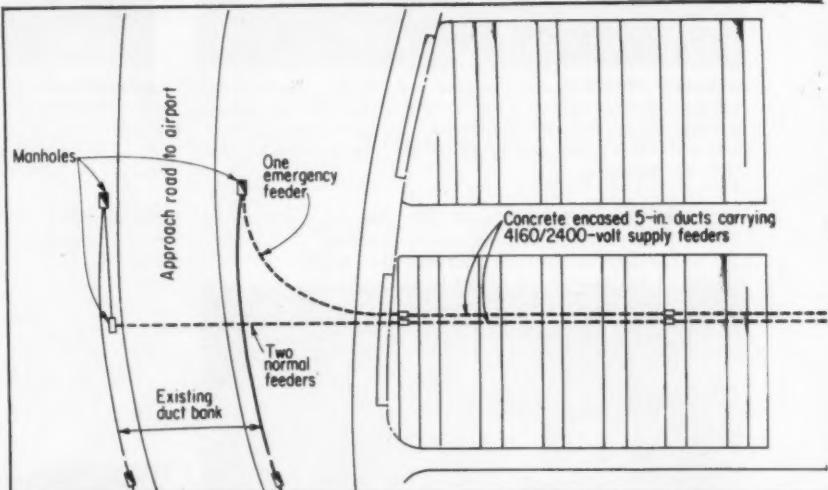
In electrical design for the system in this new hanger, initial thinking was determined by previous experience in design of hangar electrical systems. The lighting ap-

By J. F. McPartland

proach was fairly standard and followed modern use of mercury-vapor hi-bay luminaires and 277-volt circuits for efficient supply to lighting loads. And design for power loads seemed to pose no particular problems until it came to detailing the

supply of 400-cycle energy for use in airliners being serviced.

In the past, mobile frequency converter units were used to obtain 400-cycle energy for airplane servicing. These were powered from trailing cable plug connections to special 60-cycle power receptacles provided in hangar areas for this purpose. But, in this job, study re-



PLAN VIEW of hangar building showing underground primary supply feeders, location of first floor distribution facilities and basic layout of 400-cycle, 600-volt distribution system. Each feeder consists of three, single-conductor, 350 MCM, lead-

vealed that the amount of 400-cycle energy required for ten jets would make a permanent 400-cycle distribution system economical and highly desirable from the standpoints of operation and utilization. Such a plan was therefore adopted, making this job a prototype of built-in hi-cycle for commercial airline hangars. And if the availability of practical design data on the use of high frequency energy for lighting circuits had met the time schedule on design of this installation, the hi-cycle facilities might have been expanded to serve lighting loads.

Basic Distribution

Power for the hangar building is supplied by three underground 4160/2400-volt, 3-phase feeders from underground primary loops around the airport property. These feeders are tapped from the loops in manholes at the outer edge of the hangar property. They are carried underground into a transformer room on the ground floor at one end of the hangar, where the supply is arranged for normal use of two of the incoming feeders and emergency use of the third feeder.

Electrical design of the transformer room layout was done by the engineering staff of the New York Port Authority. They provided this room for secondary metering of the supply and kept it under their supervision, separate from the hangar's main switchboard room.



PRIMARY SWITCHGEAR cubicle consists of three bays (only two shown here, a third to be added on left) has 4160/2400-volt fused switches in two end bays, with an automatic transfer mechanism in center bay. One-line diagram of supply hookup shows connection of three feeders to two 3-bay switchgear cubicles. General foreman Carey of Lord Electric Company, electrical contractors, is here checking the equipment.

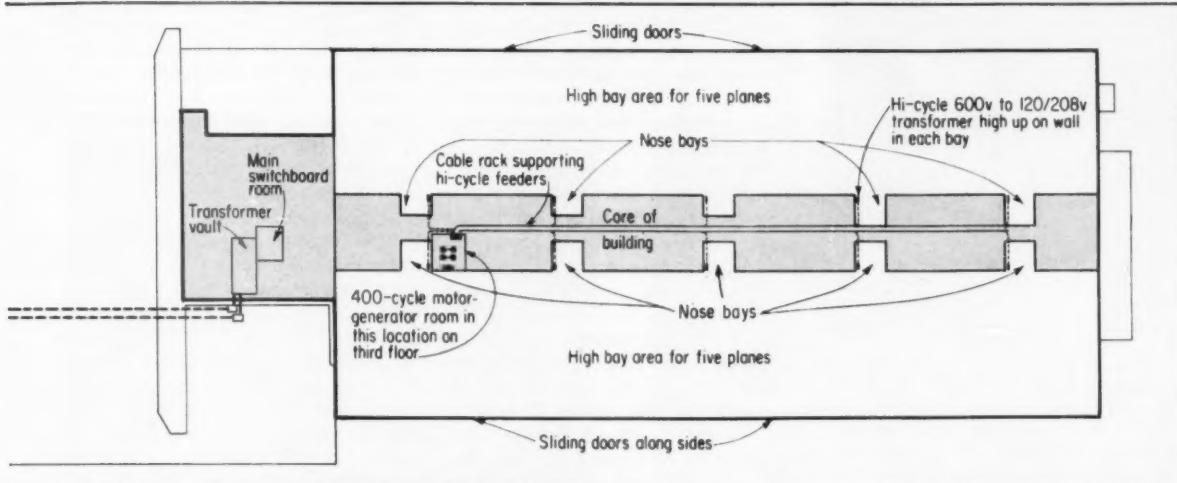
They also specified and furnished the distribution equipment in this room.

The three primary feeders are circuited through two, three-bay high-voltage switchgear cubicles, with an automatic transfer mechanism in the center bay of each. If either of the two normal supply feeders fails, the third feeder is automatically connected to pick up its load. Each of the switchgear

cubicles supplies two 750-kva, 3-phase, 4-wire transformers rated 4160/2400-volt wye primary to 480/277-volt wye secondary.

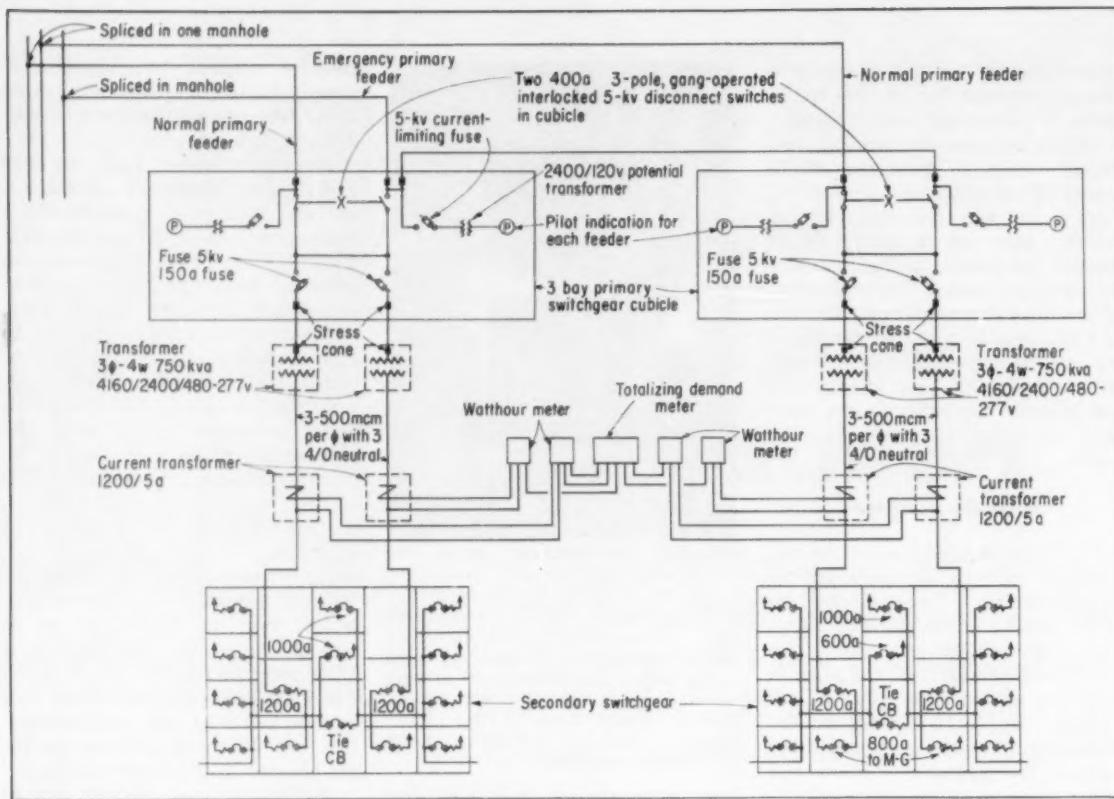
Secondary feeders from the four main transformers are carried under the floor to the nearby main switchboard room, also on the first floor. There, two double-section 480-volt circuit breaker switchboards are installed face to face, with two transformer feeders to each switchboard. In each switchboard, one transformer feeder supplies the bus on one side and a second transformer feeder serves the bus on the other side, with a tie circuit breaker between the two sections of bus. This tie breaker in each switchboard is key interlocked with the two incoming 1200-amp main circuit breakers supplying the two sections of bus in the switchboard. For the tie-breaker to be closed, one of the incoming main CB's must be opened. When either CB is opened, the key in its lock can be removed and used to open the lock which normally keeps the tie breaker in the open position.

From the two 480-volt switchboards, feeders are carried to all power and lighting distribution points. From one of the switchboards, two 1000-amp, low-impedance busway runs of aluminum bars with half-size neutrals originate. From the other switchboard, one 1000-amp busway and one 600-amp busway—also low-impedance type with aluminum conductors—originate. These four runs are car-



sheathed, polychloroprene-jacketed, 5-kv cables and one No. 4/0, double braid covered, weatherproof neutral cable. An interesting note in the job specs called the attention of the

electrical contractor to the possible presence of methane gas in manholes at the airport. The spec required that each manhole be tested for gas before any personnel entered.



ONE-LINE DIAGRAM of separate primary supplies and hook-up to secondary switchboards with ratings of larger CB's indicated. The 1000-amp and 600-amp CB's supply the busway

feeders. CB's for feeders to 400-hp synchronous motor starters for M-G sets are also indicated.

ried up to the second floor and through the core of the building.

The two 1000-amp busways from one switchboard feed taps to general 480-volt power and 277-volt lighting loads through power panels and sub-distribution panels throughout the building. They also supply 120/208-volt general purpose lighting and receptacle circuits through taps to small (300-kva and under) local dry-type transformers. The 1000-amp and 600-amp runs from the other switchboard supply taps carrying 480-volt 3-phase, 4-wire circuits down to power plug receptacles spaced along the hi-bay service areas on both sides of the core of the building.

In addition to supplying busway runs, the two main switchboards also feed conduit-and-wire circuits to power and lighting distribution panelboards in the operations end of the hangar building. These circuits supply outside floodlighting, compressors, pumps, fans, etc. But the two largest conduit-and-wire feeders originate from one of the main switchboards. These are the feeders to the motor-generator sets

used for the 60-cycle to 400-cycle power conversion.

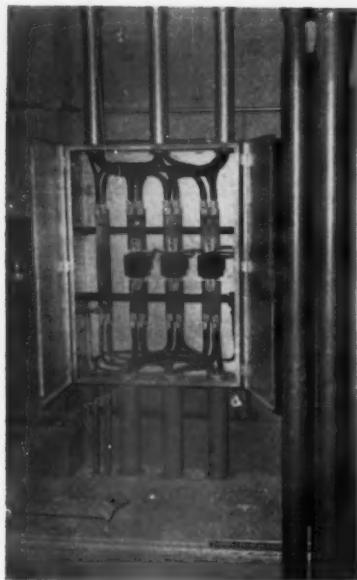
The two 400-cycle frequency converters are mounted in a third-floor room with their associated control equipment. Each M-G set is powered by a 480-volt, 3-phase synchronous motor rated at 400 hp. The circuit to each motor consists of two 500 MCM conductors per phase, with the six conductors divided between two 3-in. conduits. The circuits to the two motors (four conduits in all) are run from the first floor main switchboard up to suitable synchronous motor starters in the hi-cycle room.

The output of each of the two 400-cycle generators is rated at 300-kva, 3-phase with 600 volts phase to phase. Each generator feeds one half of the high-frequency switchboard which houses control and protection equipment for outgoing 400-cycle feeders and the exciters for the generators.

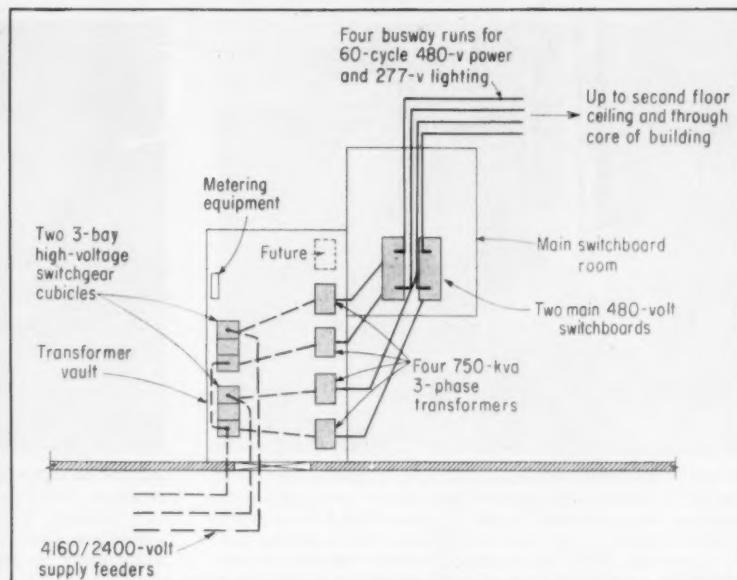
From this switchboard, 400-cycle armored cable supply circuits are carried out to the third floor corridor in the building core and run on cable racks to points adjacent to



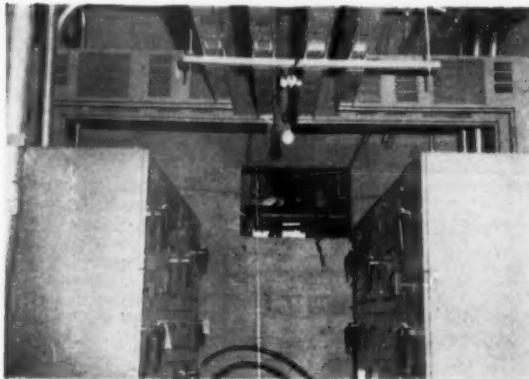
POWER TRANSFORMERS in vault are installed side-by-side. Each of the askarel type units has four 2½% full capacity taps above normal and is capable of carrying full rated load continuously without exceeding 55 degrees C rise above an ambient of 40 C. Primary supply to the units is made in the floor slab from primary switchgear off to the right. Secondary conductors are carried overhead, then down through CT cabinets and underground to secondary switchgear. Power consumption for the overall system is metered at secondary voltage in this room.



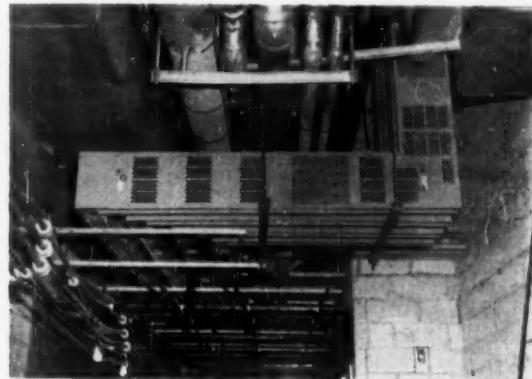
CURRENT TRANSFORMERS for secondary metering are mounted in cabinets behind the four power transformers.



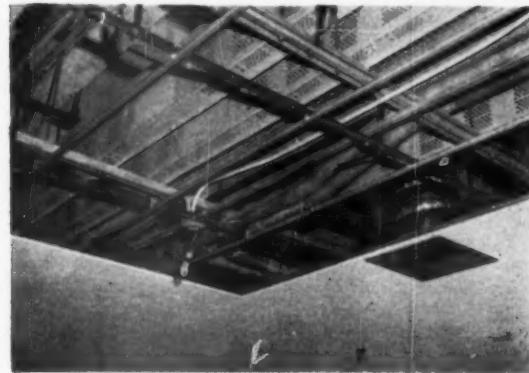
BASIC LAYOUT of transformer vault and adjacent main switchboard room. Busway runs are shown from secondary switchboards. Conduit feeders to 400-cycle M-G sets are run with the busways to points at which they are turned off to starters.



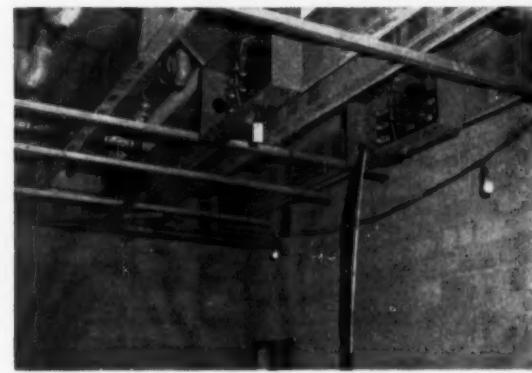
SECONDARY SWITCHBOARDS, one for each service take-off, are metal enclosed CB-type assemblies mounted face-to-face in main switchboard room. CB units are drawout air type. Busway runs are shown originating from the switchboards.



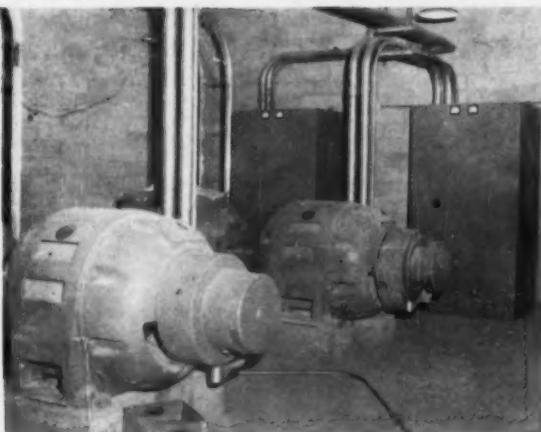
BUSWAY AND CONDUIT feeders run a short distance in the ceiling of the first floor (from main switchboard down corridor) and then turn up to second floor where they are run in suspended ceiling.



SUSPENDED CEILING of second floor conceals busway and conduit feeders (section of ceiling tiles removed here). The use of busway in a removable type ceiling was ruled not to violate section 3642 of the NE Code.



BUSWAY TAPS for 480-volt, 60-cycle power to panels and to receptacles at floor level in hi-bay areas are made by fusible switches and rigid conduit for the circuit conductors tapped on ceiling of second floor.



400-HP STARTERS for synchronous motors driving 400-cycle generators are mounted against back wall of motor-generator room and fed up through bottom by 3-in. conduits run along ceiling of second floor. Each motor controller is fed by two 3-in. conduits and is an autotransformer, reduced voltage starter type with 65% tap. Each unit includes motor field control devices, an unfused 600-amp disconnect switch and has a start-stop pushbutton with pilot light built into door. The two motors, both shown here, are fed overhead in conduit from the starters.

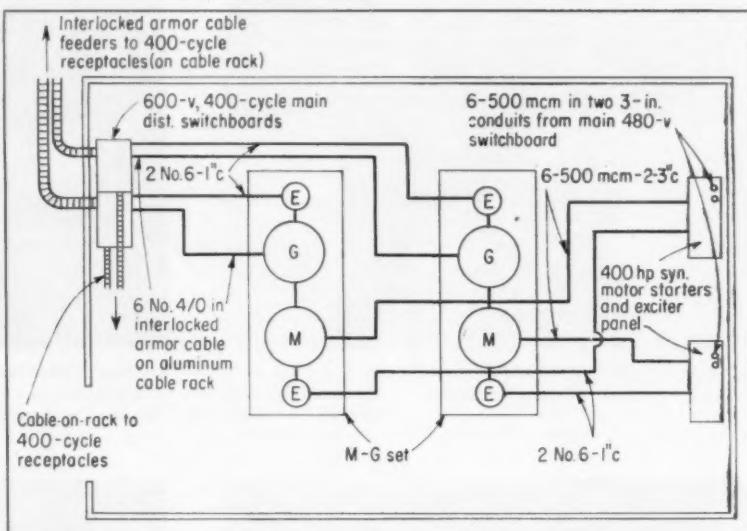


MOTOR-GENERATOR (one shown here) for conversion from 60 cycles to 400 cycles consists of: a 400-hp, 400-kva, 1200-rpm, 480-volt, 3-phase, 60-cycle synchronous motor (at left), with a 3-kw, 125-volt, shunt-wound, direct-connected exciter and suitable for operating at 0.8 leading power factor; and a 300-kva, 1200-rpm, 346/600-volt wye connected, 3-phase, 400-cycle generator (at right on base), with a 10-kw, 250-volt, shunt-wound, direct-connected exciter and an operating power factor of 0.85. The 400-cycle generator control and distribution switchboards are shown in background.

the plane nose bays. Each nose bay is a high bay indentation in plan of the building core to permit the nose of a large plane to be moved far enough into the hangar for the tail of the plane to clear the hangar doors. At a point adjacent to each such nose bay, one of the 400-cycle circuits turns from the straight rack run and is carried on smaller rack through the wall of the building core out to a transformer mounted on the wall of the nose bay high up at the level of the third floor. Each transformer is a 3-phase, 112½-kva unit rated for 600 volts delta primary and 120/208-volts, 3-phase, 4-wire wye secondary at 400 cycles. The armored cable secondary circuit is then carried down the wall of the nose bay to a special receptacle layout which provides ready use of the 400-cycle energy aboard a plane.

Special Design

Design of the 400-cycle distribution system involved a number of unusual studies. For instance, the effect of increased inductive reactance due to the high frequency of current alternations had to be carefully related to voltage drop and regulation at the receptacle outlets. At 400 cycles, it was found, the resistive component of circuit impedance was very small, even taking into account ac resistance increase due to skin effect. There was



M-G ROOM contains 400-cycle conversion equipment and distribution switchboard.

nothing to be gained by increasing the size of circuit conductors over that required by the current and based on temperature rise. The voltage drop in the runs was almost wholly due to inductive reactance and could be minimized only by minimizing the inductance of the runs.

The problem involves some effects which might be reviewed here. When alternating current flows through a conductor, it sets up an alternating magnetic field about the

conductor which produces an emf in the conductor opposing the impressed emf. The self-induced emf in the conductor is actually an indirect measure of the inductive reactance which causes voltage drop. Self-induction of emf can be reduced by reducing the flux density of the magnetic field producing it. The flux density of the magnetic field depends upon the magnetomotive force set up by the current flowing through the conductor (which is dictated by the load) and

Excerpts from the Job Specs

GROUNDING—"Transformers, primary disconnecting switches, compartment frameworks, bus enclosures, ground buses in compartments . . . and other non-current-carrying metallic parts of all electrical equipment shall be securely grounded to common ground buses insofar as practicable. Ground buses shall be connected to ground electrodes . . . No soldered connections shall be used . . . The lead sheath of all high-voltage cables shall be grounded to the common ground bus used to ground all non-current-carrying parts of the transformer room, or to individual ground rods in manholes and handholes. The low-voltage system neutral shall be solidly grounded through the transformer casing at each transformer."

"Grounding connections to equipment such as 480/120-208-volt, 60-cycle or 600/120-208-volt, 400-cycle transformers, motor generator sets, etc., remotely located from the ground buses or grids, shall be made to the nearest available cold water piping systems. All motor frames shall be effectively grounded through their conduit."

WIRING—"For all underground wires and cables and for all 277/480- and 120/208-volt main feeders and taps therefrom, the Contractor shall fasten a cable tag to each end of each cable, wire or group of wires comprising a circuit or feeder and to each of the foregoing in the cable pits, manholes, handholes, pull-boxes, terminal boxes and cabinets, and wiring troughs through which such wires run or at which they terminate. Each tag shall bear the respective circuit, feeder or cable designation and shall be fastened to conductors at both ends of the tag with a weatherproof No. 12 AWG copper wire . . . Tags shall consist of .018 gauge brass tape $\frac{3}{4}$ -in. wide embossed with the proper designation . . .

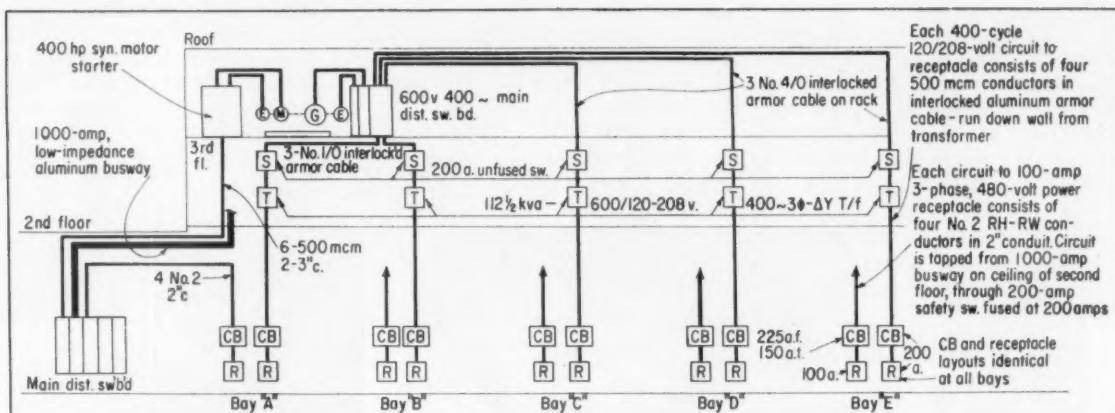
"At the terminal connections of the 2400/4160-volt power cables at switchgear and transformers, the Contractor shall install stress cones . . . and . . . a grounding strap connection to the cable lead sheath or shield. A No. 6 AWG grounding conductor shall be installed from the ground straps . . . to the ground bus in the cubicle.

"All wires and cables in power manholes, handholes, and all 120/208-volt main feeders, including taps therefrom, which occupy a common junction box, pull box, wiring trough or other common enclosure shall be grouped by circuits and fireproofed . . . within the enclosure . . . with a layer of . . . asbestos tape . . . and painted with a 50% water solution of silicate of soda (waterglass) . . .

"Feeder cables to disconnecting switches, circuit breakers and other equipment shall be connected and marked so that the phases are A, B and C when facing the front of the equipment and reading from left to right."

BUSWAY—"At intervals throughout each run of bus duct, certain sections are to have specially constructed expansion joints built into the standard length. Conductors . . . are to have flexible braided shunt connectors to allow for maximum possible expansion or contraction. The housings are to be of telescopic construction permitting movement without distortion. Flexible shunt connections are to be brazed to the sections . . . to insure continuous ground . . .

"The bus duct . . . shall have a voltage drop throughout its complete length not to exceed 3% based on 80% power factor at 80% load factor . . ."



BASIC RISER diagram for 60-cycle and 400-cycle power distribution to receptacles in the five nose bays along one side of the hangar. To simplify drawing the second floor run and taps of busway are omitted. A similar riser layout supplies receptacles similarly placed along the other side of the hangar.

As shown, the interlocked armor cable runs for the three bays (C, D and E) most distant from the 400-cycle switchboard are larger (No. 4/0) than those (No. 1/0) to the nearby bays (A and B). This upsizing for longer runs keeps voltage drop due to resistance within limits.

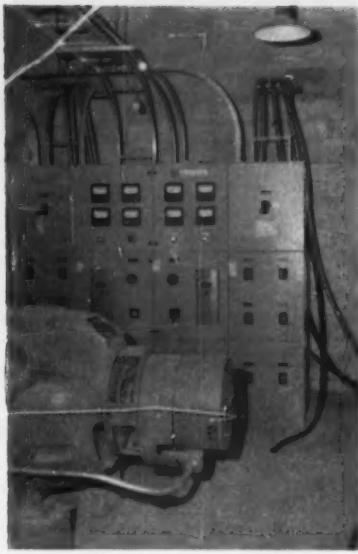
the reluctance of the flux path. Flux density decreases with increasing reluctance. The overall voltage drop due to inductance can therefore be minimized by providing a high reluctance path. This would mean that any material in close proximity to the conductors should be of low permeability (the reciprocal of reluctance for a given unit of material).

From the foregoing, the use of aluminum was clearly dictated for use as a raceway because of its non-

magnetic character. It would minimize self induction and consequent voltage drop. The choice then was between busway with an aluminum enclosure, conductors in aluminum conduit or interlocked armor cable with aluminum armor. The armored cable was selected for many reasons. Among other things, it offered unusual flexibility for this application, and it kept conductors very close together to provide maximum mutual cancellation of the conductor fields, providing absolute

minimum of reactance. It should be noted that elimination of magnetic material from the conductor fields and close spacing for mutual cancellation also minimizes skin effect which results from self induction.

Still other application of aluminum was made to keep reactance down. The racks on which all of the hi-cycle cables are mounted are also aluminum. And the complete panel construction of the 400-cycle distribution switchboard is of sheet aluminum.



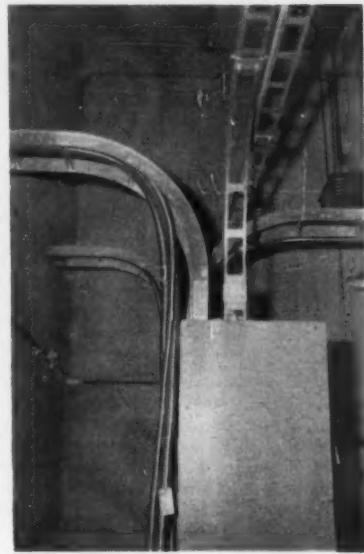
400-CYCLE SWITCHBOARD is divided into two parts (left and right), one for each of the two generators. Assembly includes one main 400-amp breaker for each generator, one 400-amp tie breaker, 150-amp feeder breakers, instrumentation, generator field resistors, rheostats and voltage regulators. To assure minimum inductive reactance in the 400-cycle circuits, the metal enclosure, all metal barriers and all metal structural members are made of aluminum. All cable racks and the cable armor are also aluminum to minimize reactance. Five circuits originate from the extreme left-hand cubicle and five circuits from the extreme right-hand cubicle. Each of the ten circuits supplies a receptacle in a nose bay through a 400-cycle transformer.

CABLE RACKS for 400-cycle circuits to nose bay receptacles originate from top of 400-cycle switchboard and run out to left into corridor running through core of building. Rack from right supports main 400-cycle feeders from generators.

Voltage regulation on the 400-cycle circuits had to be carefully calculated. Given the basic unit of voltage drop per unit length in each 400-cycle cable, the output voltage at the receptacle outlets would vary depending upon the length of each cable (the distance each ran from the generator panel). To keep the 400-cycle, 120/208-volt output the same value at all outlets, it was necessary to adjust taps on each

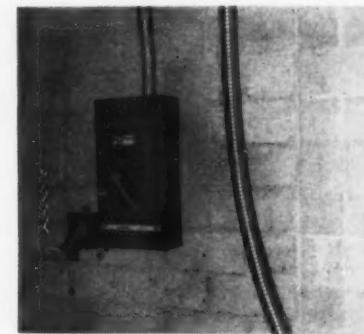
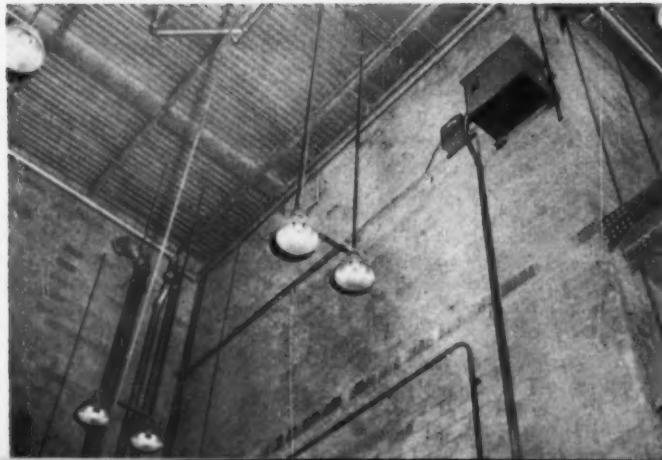
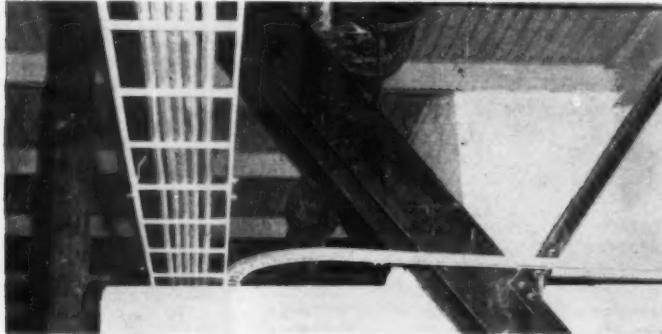
400-cycle step-down transformer for rated voltage at the receptacle outlets.

The arrangement of equipment at each outlet location on the 400-cycle system was designed in conjunction with the airlines engineering staff. The main objective was to make the energy readily available with complete safety. As designed, a trailing cable will be used to supply a plane from each 400-cycle out-



let, with a control line in this cable to operate the circuit breaker feeding the outlet. The low-voltage dc system of the plane will be used to operate the CB to energize the line.

The architects on this job were Kahn and Jacobs and Roy S. Bent, Associate. Clifton E. Smith was a consulting electrical engineer; Turner Construction Co., were the general contractors for American Airlines on this job.



HI-CYCLE CIRCUITS of interlocked armor cables run through core of building on cable rack to point of turnoff out to nose bay (left top). Individual circuit is carried on 4-in. rack along wall of nose bay to unfused safety switch feeding 112½ kva, 600-volt delta, 120/208-volt wye connected, 400-cycle transformer on wall (left). Secondary conductors from transformer are carried down wall to receptacle location. Photo above shows armored cable hanging alongside 225-amp CB and 100-amp receptacle for 480-volt, 60-cycle power, prior to installation of 400-cycle CB and receptacle layout. Vertical run of armored cable is clamped to channel strip bolted to wall.

Dallas Convention Highlights

Convention personalities at the annual meetings and electrical trade exposition of the National Electrical Contractors Association held in the Dallas Memorial Auditorium, Dallas, Texas, November 18-22. For the convention report see page 137.



Rob Roy, Rob Roy Electric Co., Dallas, Texas; B. P. Burnett, Burnett Electric, Shreveport, La.; Frank Smiley, National Electric Construction Co., Kansas City, Mo.; Fred Sulzer, E. Fred Sulzer Co., Cranford, N. J.; W. G. Nordling, Nordling Dean & Co., Summit, N. J.; James McKinnies, Watson-Flagg Engineering Co., Paterson, N. J.; James Adams, Adams Electric, Trenton, N. J.; W. Edward Frazer, H. B. Frazer Co., Philadelphia, Pa.; John Terrell, Terrell Electric Co., Chattanooga, Tenn.



G. H. Simpkin, G. H. Simpkin Ltd., Montreal, Canada; David Jacobs, David Jacobs Inc., Hunter, N. Y.; J. R. Freije, Freije Electric, Binghamton, N. Y.; Dewey Smith, Dewey Electric Inc., Ventura, Ia.; Oliver F. Burnett, Kelso-Burnett Electric Co., Chicago, Ill.; Tom O'Dwyer, Ling Electric, Dallas, Texas; Tom McClure, Miller Electric, Atlanta, Ga.; E. W. Collier, E. C. Ernst Inc., Atlanta, Ga.



L. A. Nelson, Langdon-Hughes, Utica, N. Y.; J. M. Doster, Doster and Egan, Syracuse, N. Y.; John O'Connell, O'Connell Electric, Rochester, N. Y.; Fred Oertli, Guarantee Electrical Co., St. Louis, Mo.; John Myers, La Vigne Electric, Miami, Fla.; E. H. Seaton, Seaton Electric, Miami, Fla.; J. W. Slaughter, S. & S. Construction Co., Olathe, Kansas; John Corbin, Corbin-Dykes Electric Co., Phoenix, Arizona; Henry Friedman, Thomas Henry Electric, West Nyack, N. Y.; Robert Bauer Electrical Installations Inc., Roselle Park, N. J.



Bill Miller, American Electric, Ft. Worth, Texas; Leon Dyer, Empire Electric, Ft. Worth, Texas; Harry White, White Electric, Ft. Worth, Texas; Fred Vanderlinde, Vanderlinde Electric Corp., Rochester, N. Y.; Robert Blake, Blake Electric Co., Geneva, N. Y.; Emmet Molz, Hickson Electric, Rochester, N. Y.; R. A. Goeller, Jr., Hotzel & Buehler, New York, N. Y.; H. W. Mentrup, Nola Electric, New Orleans, La.; W. Weibel, Weibel Electric, Akron, Ohio.



Sylvan Byck, Byck Electric Co., Savannah, Ga.; Ralph Ramis, Stinson Electric, Jacksonville, Fla.; M. A. Sonnenberg, Jacksonville, Fla.; James Dandlak, Miller Electric Co., Jacksonville, Fla.; Richard Pruzick, A. A. Pruzick Co., Jersey City, N. J.; W. Burnett, Burnett Electric, Bayonne, N. J.; R. Almond, Almond Electric Co., Tulsa Oklahoma; Kenneth Priestley, Eastern Electric Construction, Bridgeport, Conn.; Al Frank, Eastern Electric, Boston, Mass.



Orson Taylor, Taylor Electric, Toledo, Ohio; Jacques Mann, E-J Electric Installation Co., New York, N. Y.; W. R. Grasle, W. R. Grasle Co., Portland, Oregon; W. R. McCabe, Lord Electric Co., Portland, Oregon; Phil Tripp, Tripp Electric, Minneapolis, Minn.; Jerold Snyder, Enterprise Electric Co., Minneapolis, Minn.; Egbert Heine, Albin Gustafson Co., New York, N. Y.; Warren Talasko, Arc Electric Construction Co., New York, N. Y.; J. M. Joseph, Modern Electric Contracting Co., Jacksonville, Fla.; W. G. Hoffman, Tennessee Armature and Electric Co., Knoxville, Tenn.



Albert Manzi, Manzi Electric Corp., Lawrence, Mass.; Edward Nager, Nager Electric Co., Brooklyn, N. Y.; Henry C. Parke, Marine Electric, Brooklyn, N. Y.; Ellis M. Fagan, Fagan Electric Co., Little Rock Arkansas; Rex Grissom, R. M. Grissom Co., Santa Ana, Calif.; E. E. Leisure Monroe Electric, Chicago, Ill.; William Hogan, Chicago, Ill., Albert Kahn, Monroe Electric, Chicago, Ill.; Fred Stoeck, Hoffman Electric, Chicago, Ill.



Horace Brown, Sachs Electric, East St. Louis, Ill.; L. C. Scott, Glasco Electric, St. Louis, Mo.; John Kostka, Bond Electric, St. Paul, Minn.; W. Booth, Brite-Lite Electric Const. Co., St. Paul, Minn.; John Callaway, Callaway Electric, Anniston, Alabama; Herbert Gold, Gotham Electric, Dallas, Texas; George Wolfe, A. J. Wolfe Co., Boston, Mass.; Edward Jacobs, Service Electric Construction Co., Cleveland, Ohio

In Quincy, Mass.:

Fire Detection Alarm Ordinance

**makes compulsory the installation of heat-activated
alarm systems in all new residential structures.**

BY ESTABLISHING what perhaps is the first ordinance of its kind in the country, the city of Quincy, Mass., has taken the first step in a battle to reduce loss of life and property from fire.

The provisions, comprising Sec. 196A, Chapter 4, of the City Ordinances, were adopted as of July 1, 1958, and read as follows:

"In all structures used for residential purposes herein-after constructed, there shall be permanently installed an approved heat activated fire alarm system. Fire detectors shall be located in each livable room, at the head of each stairway, in the cellar or basement, and in the furnace room.

"All such devices must be of a type approved by a Board consisting of the Chief of the Fire Department, Inspector of Buildings, and Inspector of Wires. The alarm shall be sufficiently loud and suitably located to arouse all persons residing therein."

To eliminate doubt as to the exact requirements necessary for approval, six pages of rules and regulations governing the construction, installation and operation of alarm systems have been made part of the ordinance.

Instrumental in formulating the ordinance and getting it adopted were Fire Chief Thomas F. Gorman, Inspector of Wires William H. Pitts, Inspector of Buildings Alrick A. Weidman, and his assistant, Allan F. MacDonald—with very material aid from the *Quincy Patriot Ledger*, a daily newspaper.

Ten lives have been lost in destructive fires within the city limits in little more than two years; this has been the chief motivating force behind the ordinance. Presently engaged in an urban redevelopment program in an attempt to raze unfit residential structures, city officials saw the wisdom of instituting measures now which would insure protection of all new construction while they labored to correct existing hazards.

Fire Chief Gorman expressed the opinion that several of the deaths in the city due to fires could have been prevented had the occupants been awakened sooner. Repeated editorials by the newspaper supporting the alarm proposal plus front-page treatment of all fires helped considerably to make the public and the city officials fire conscious. This is evidenced by the fact that, although the ordinance

applies only to new construction, hundreds of existing homeowners have installed alarm systems on their own initiative since the measure was initially proposed.

An overwhelming majority of the alarms being installed are going through electrical contractors and electrical distributors. Some initial bad experience with door-to-door salesmen handling systems at excessive prices which do not meet ordinance requirements have made existing homeowners wary. However, as Inspector of Wires Pitts points out, his jurisdiction extends at present only to new residential units; and the possibility always exists that homeowners will purchase units without consulting responsible parties, resulting in a false feeling of security should the equipment be sub-standard.

The alarm systems required by the ordinance may be either the closed- or the open-circuit type, using heat-activated detectors which will cause an alarm to sound when the ambient temperature reaches a certain value (fixed temperature type) or rises a given amount in a short period of time (rate-of-rise type). In most cases there will not be a connection to a fire call box nor provision for automatically extinguishing the fire; the main objective is to provide immediate warning of a fire to enable the occupants to vacate the premises safely. It is an established fact that most fire deaths occurring during the night are due to superheated air and smoke which rise to the uppermost portions of the house and finally engulf and asphyxiate the sleeping occupants. With prompt detection and alarm, escape



INSPECTOR OF WIRES William H. Pitts did a considerable amount of research into existing fire alarm systems, their operation, and their effectiveness before formulating the electrical requirements which were finally written into the ordinance.



CITY OF QUINCY Fire Chief Gorman, Inspector of Buildings Weidman, and Assistant Inspector of Buildings MacDonald examine one of several scrapbooks of newspaper clippings representing a complete record of city fires, the fire alarm ordinance, and the urban redevelopment program.



ELECTRICAL CONTRACTOR John Haviland lives in Weymouth, Mass., bordering Quincy. His experiences since the passing of the ordinance typify those of most contractors in the area. Prior to 1957, he had no fire alarm business. A Zonalarm system installed in a nursing home led directly to a second nursing home through a recommendation of the owner; the second home also engaged Haviland for a new service entrance installation. He ascribes his present fire alarm activities, which also include two churches and a housing development, to the interest accompanying the ordinance.

may be effected before this danger point is reached.

Electrical installation requirements were drawn up by Inspector Pitts, and judgment as to the suitability of specific fire alarm components rests with Pitts, Fire Chief Gorman, and Building Inspector Weidman. Permits must be obtained for their installation, as with other electrical work.

Dry cells must not be used as the main source of power; wet cells may be used only if automatic

charging equipment is included. All wiring from the source of supply to the alarm panel or to auxiliary alarm devices must be in conduit or EMT, Type AVA or RH wire. Detector circuits must be No. 18 or larger, and need not be in raceway.

Transformers used must have energy-limiting characteristics; alarms are required to have a rating of not less than 65 decibels. Any area which may be isolated by closing a door (except a closet door) must have at least one detector.

The alarm circuit must be a separate circuit connected to the line side of the main service disconnecting means for the building. The conductors to the short-circuit protective devices thus must fulfill requirements for service conductors. All units must be direct-connected; cap-and-receptacle connection is not acceptable.

All possible precautions have been taken to make the system, once installed, independent of any special maintenance or service. Dry batteries were outlawed because the system dependability would be affected by the state of the battery. And experience with automatic emergency lighting units, required in public areas of the city, has shown that around 90% of the units are ineffective because exhausted batteries are not replaced.

No supervision of individual detectors or detector loops is required, although approved systems incorporate one or more test buttons which should be pressed periodically to test the continuity of the circuits. Systems being installed include a simple bell-relay combination with a single detector loop as well as more elaborate units with zone-indicating pilot lights with test buttons.

Today's big problem in Quincy involves old homes and summer cottages converted for year-around use through the installation of dangerous oil heaters. The new ordinance does not affect these homes directly; however, it is hoped that jurisdiction may in the future be extended to new apartments created out of old, and eventually to all dwellings.

Initial support for the proposal by the City Council was slow in coming, although there never was any significant opposition. Originally introduced in mid-1957, the measure was tabled without action. Then early Christmas morning a mother and her two daughters died in their sleep when fire destroyed their home. The alarm ordinance was again introduced, with much newspaper publicity; this time quick action was taken and the ordinance was passed.

Dozens of requests for details from other cities throughout the country indicate definite interest and a growing consciousness by the public of the extreme importance of prompt and dependable fire detection and warning.

Evansville Contractor Designs Flexibility for . . .

Relighting a Hotel Dining Room

The installation combines incandescent perimeter lighting, incandescent cove lighting, cold cathode color tubing and floodlighting, manually operated dimmer switches, and remote control low-voltage switching.

THE final step towards modernizing the main dining room of the McCurdy hotel in Evansville, Ind., was accomplished by completely rejuvenating the room's lighting system. The biggest problem faced in changing from a traditional, formal setting to a modern, relaxed, functional atmosphere was that of designing a lighting system to blend in with the new interior decor that would be flexible and so arranged that a wide variety of intensities and lighting effects could be easily obtained and readily available.

The lighting job, design, and complete rewiring installed by the Althoff-Howard Electric Co. of Evansville solved this problem. By combining incandescent perimeter

lighting, incandescent cove lighting, color cold cathode tubing and floodlighting, manually operated dimmer switches, and remote control low-voltage switching, the new lighting system adjusts to any desired degree of illumination needed to create the proper atmosphere for dining, dancing, shows, or meetings. Besides causing these various effects, the lighting layout leaves the ceiling entirely free of surface fixtures, while at the same time highlighting and complementing the room's interior decorations.

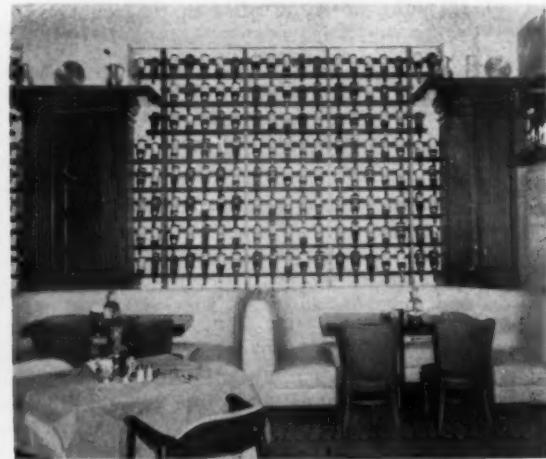
Incandescent strip lighting around two-thirds of the room's perimeter are mounted to the old existing ceiling and are located behind window grilles and bottle rack displays. The strips are made of

porcelain sockets located on 8 in. centers and contain R-20/30-watt reflector type flood lamps. This arrangement provides the room with overall illumination, while still highlighting the decorative design of the window grilles and bottle rack displays by flooding them with a hidden source of light. In order that an even amount of light would be spread over the entire bottle rack display, incandescent strip lighting was used at the bottom of the display as well as the top.

Built-in-lighting, also in the form of incandescent strips holding 30-watt reflector type floods, are used in coves around four, 4-ft by 4-ft mirrored interior columns. So that uniform light patterns would be provided over the entire dining



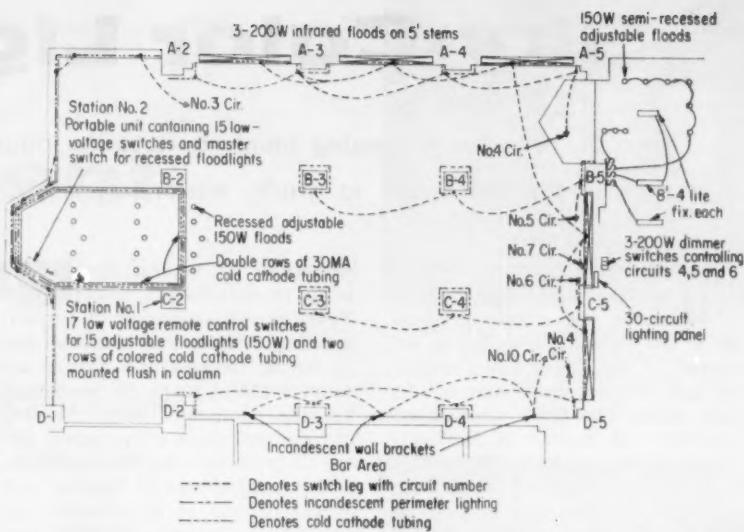
INCANDESCENT COVE LIGHTING installed around interior mirrored columns are dimmer controlled to provide flexible lighting arrangements for variety of activities.



INTERIOR DECOR features a unique bottle display rack flooded with a hidden source of light from recessed incandescent strip mounted above and below the display.

area for general lighting, this same effective concealment of light sources was installed in the coves of ten exterior columns that semi-surround the room. This concealed lighting, laid in the coves of the four interior columns and the ten exterior columns, has a combined total of 5,250 watts that are divided into three circuits. Each of the three circuits is controlled by a 2,000-watt manually operated dimmer switch. The dimmer switches, installed in the kitchen adjacent to a 32-circuit, 115/220-volt, 3-wire, single phase panel, are operated by dining room employees to produce a successive blending of lighting moods that provide a wide range of lighting effects for all functions.

Supplementary, flexible lighting for the stage and dancing area is a combination of two rows of recessed 30-ma rose pink color cold cathode tubing and three bays of five 150-watt recessed floodlights with various colored roundels. Each 150-watt recessed flood is controlled by low-voltage remote control switching from a bank of switches installed in the column to the left of the dance floor in front of the stage. A second group of 15 low-voltage switches and one master switch that also controls the 15 recessed floodlights are contained in a portable assembly unit located on the stage and operated by the entertainers to give instantaneous lighting control for their various acts. The two rows of color cold cathode tubing recessed in the stage cove are controlled by two low-voltage switches



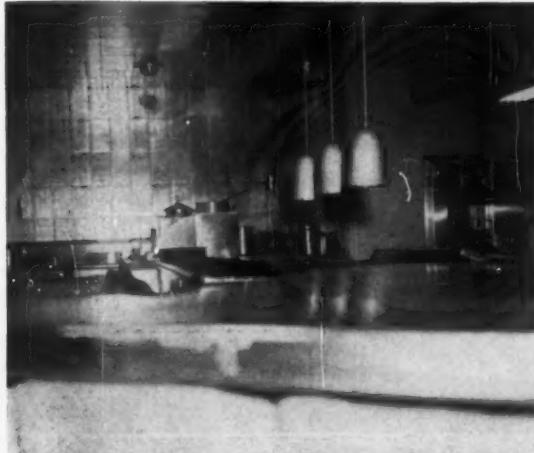
DRAWING shows position of incandescent strip lighting, including color floodlighting, cold cathode color tubing, kitchen lighting, low-voltage remote control switching, dimmer switches and 32-circuit, 115/230-volt, 3-wire, single-phase panel.

installed beside the 15 remote floodlight switches that are mounted in the column to the left of the stage.

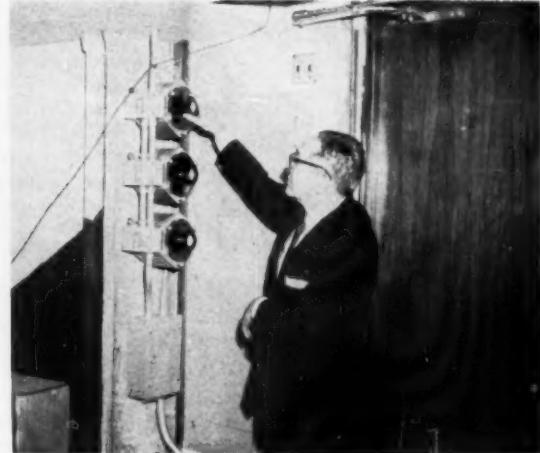
Lighting for the kitchen directly adjoining the dining room consists of three recessed 8-ft, 4-lamp troffers with plastic diffusers for general lighting, and six eyeball recessed floodlights to illuminate 9-in. by 9-in., 14 karat gold kitchen wall tile that can be seen from the dining room through open charcoal fired broiler hearth. Three gold-hooded down lights on 5-ft stems, each containing a 200-watt infrared lamp, installed over the warming

table, can also be viewed from the dining room.

In keeping with the general rewiring, relighting and modernization project, the job called for the installation of additional convenience outlets and telephone jacks, air conditioning wiring and a complete hi-fi system that included 12 recessed hi-fi speakers connected to a 50-watt amplifier. The new sound system enables programs to be selected from the house music system, radio programs, stage and dance floor programs, and music from the piano bar in the den.



DECORATIVE LIGHTING that is also functional was employed in the kitchen adjoining the dining room. Gold-hooded infrared lamps are installed over warming table.



MANUALLY CONTROLLED 2,000-watt dimmer switches are operated to create proper atmosphere for dining, dancing, shows, or meetings.

Sky-Color Lighting

in a St. Louis fur processing plant captures the natural shades of seal skins, making the furs easier to grade, easier to process, and easier to sell.

"DAYLIGHT without windows" are the words that best describe the effects produced from the lighting installation employed by the Fouke Fur Company to help process, grade and sell fur seal skins. The firm, whose headquarters are located in St. Louis, Mo., is known as the world's largest processor and supplier of fur seal skins to the garment-making industry. Working closely with the United States government (who owns the seals), the Fouke Fur Company processes, and then sells (at auctions twice a year), over 90% of the world's seal skins to buyers from many foreign countries.

Because the color of the seal's fur is one of the determining factors indicating the fur's value, a lighting system was needed in the grading and inspection room that would provide complete absence of highlights, shadows, or reflections—and at the same time give the worker grading and processing the fur, as well as the prospective buyer, an accurate view of the fur as it will look where it will be worn, namely in natural outdoor light.

To solve the problem, lighting engineers from Sach's Electric Company of St. Louis and repre-

sentatives of several fixture and lamp manufacturers worked with Fouke's own engineers in experimenting with various combinations of lamps, fixtures and fixture arrangements. Groups of temporary lighting equipment were installed and the seal skins were viewed under all types of lamp combinations. After many weeks of testing, and by the process of elimination, the combination of two daylight, one cool white, and one blue 8 ft T-12 fluorescent lamps were finally selected for the lighting job.

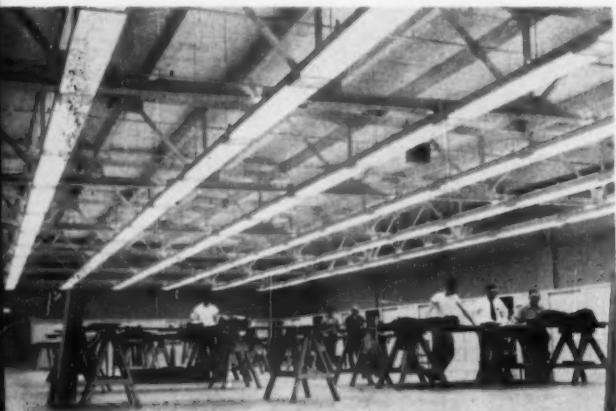
Specially designed fixtures manufactured by the G & M Fixture Company of St. Louis were installed to hold the selected combination of lamps. They were suspended from the high ceiling by 1-in. metal rods to a height 10 ft above the floor. Each of the six rows of louvered fixtures is approximately 150 ft long and stationed on 8-foot centers. At installation time they provided the room with 105 fc and since have maintained a lighting level of 95 fc.

In order to achieve a better color balance of light, 15 16-in. square incandescent units were built into the six rows of continuous fixtures and staggered on 8 ft by 8 ft centers. Each unit contains a 25-watt inside frost lamp and has a flat Fresnel

lens to spread the light evenly. By combining these incandescent units with the fluorescent lamp combination, it was possible to provide an even distribution of incandescent color correction throughout the area. With this arrangement the overall color temperature of the room ranges between 6500 and 6800 degrees Kelvin, which is about the same effect as produced by a northern sky on an overcast day.

Other factors that had little to do with the electrical work, but had to be given careful consideration in order to produce the desired atmosphere, involved the color of the walls, ceiling, work tables and flooring. The walls, ceiling, superstructure of the ceiling and fur storage cases surrounding the room to a height of 7 ft are all painted beige. The work tables where the furs are graded and inspected as well as the asphalt tile flooring are both done in a neutral gray. The use of these soft colors helped to reduce glare and contrast, lessened light loss, and was instrumental in producing the quality of light needed.

The entire fur inspection and grading room is air conditioned and all electrical facilities are operated from a 4-wire, 120/208-volt distribution system.



INCANDESCENT UNITS built into rows of four-lamp, 8-ft fluorescent fixtures are staggered on 8 ft by 8 ft centers to help supply overall color temperature of the room that ranges between 6500 and 6800 degrees Kelvin.



ARTIFICIAL DAYLIGHT produced from lighting system in windowless room enables worker to grade and process fur seal skins under same conditions as natural light. Many lamp combinations were tested to achieve balance of system adopted.

Small Apartment Rewiring

features standard meter equipment plus individual breaker cabinets.

A COMPACT and efficient service and distribution installation was devised to replace the inadequate electrical equipment serving an 8-family Pelham, N. Y., apartment building.

Faced with several tenants' expressed desire to purchase air conditioning equipment plus problems arising from an existing overloaded service, the building owners decided to tear out old service and distribution equipment and provide the facilities for increasing the capacity to the individual apartments.

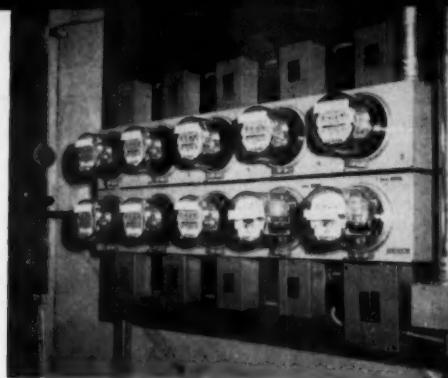
Old service consisted of three No. 6 conductors, single phase (illegally fused at 100 amps to hold the overload) with single 15-amp metered circuits to the apartments of the eight tenants and the building superintendent. Two commercial tenants, a butcher shop and a delicatessen, were fed by unswitched plug fuse cabinets located in the basement.

Old service and metering equipment, located in widely separated and inaccessible parts of the basement, were pulled out. The new installation consists of two 200-amp, 3-phase, 4-wire pullout switches on one wall of the basement. From these switches, two runs of No. 1/0 RH-RW conductors in 2-in. conduit cross the ceiling to the meter room. One feeds two 100-amp, 3-phase, 4-wire strap-type meters for the two commercial tenants; the other feeds the single-phase, 3-wire, 110/220-volt socket-type meters for eight tenants, the superintendent, and building power (stairways, basement, etc.).

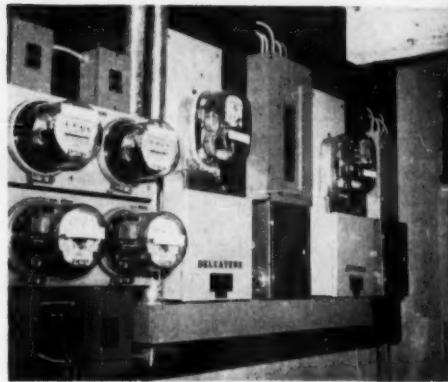
The single-phase meter equipment, mounted in two rows of five

meters each, are the multiple horizontal trough type, 2- and 3-position, rated at 100 amps per meter position. Each meter socket is nipped into a small 2-breaker panel located above and below the meter equipment, except for the building power panel, which has four circuits. At present, only one 15-amp breaker is used in each of the tenant panels; the old No. 14 armored cable feeders to the apartments were rerouted to the new meter position and are still in use. Each apartment, however, was furnished with a new 6-circuit breaker panel. When more capacity is required by a tenant than is available from the 15-amp circuit and he agrees to an established increase in rental (or when an apartment is vacated and rented to a new tenant), a new 3-wire No. 8 RM-RW feeder will be run to his apartment panel. A 20-amp, 3-wire air conditioning circuit will be installed in the apartment plus two 20-amp kitchen appliance circuits. The existing 15-amp general-purpose circuit within the apartment will remain as is.

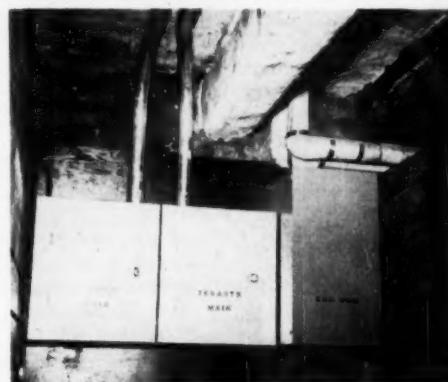
For the delicatessen, a 14-circuit, 3-phase, 4-wire, 100-amp circuit breaker panel was installed in the meter room, together with a 60-amp, 3-phase, 3-pole fused pullout switch for future air conditioning. Owners of the butcher shop, not desiring to assume the additional expense of a breaker panel, had a 12-circuit, 3-phase, 4-wire, plug fuse panel installed plus a 60-amp air conditioning pullout switch. Rewiring costs for the two shops were shared by the apartment owners and the two tenants at time of installation.



RESIDENTIAL TENANT metering and individual feeder protection equipment is mounted on large plywood panel supported by slotted angle iron on meter-room wall.



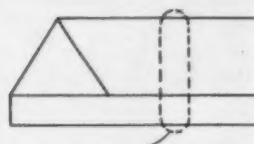
COMMERCIAL TENANTS now have individual panels with 60-amp switch below for future air conditioning.



SERVICE SWITCHES for stores and residential tenants were mounted next to end box on basement wall opposite meter room; feeders to meter equipment were run across ceiling in 2-in. conduit.

This arrangement represents an economical and practical solution to the overload problem facing a large percentage of existing multiple-family dwellings. The installation was designed and installed by William Fath, electrical contractor of Mount Vernon, N. Y.

A three-phase, 3-wire circuit with two parallel conductors per phase.



Six conductors,
2 per phase

Section 3105 states that conductors in sizes 1/0 and larger may be used in multiple, as shown in this example.

Question: Does NEC prohibit use of conductors smaller than 1/0 in multiple?

LIMITED APPLICATION of conductors in multiple is suggested by NEC, but ruling is not absolutely clear.

Electrical inspectors discuss . . .

"Code Toughies"

Highlights of the code clinic sessions of the annual meeting of the Eastern Section, International Association of Electrical Inspectors, at Monticello, N. Y.

A NY convention of electrical inspectors is bound to reach its peak of interest in question-and-answer discussions on the code itself. The recent IAEI convention at Monticello, N. Y., was no exception. Each of the three "Code Clinic" sessions was a give-and-take exchange among the moderator, a panel of code authorities and the members. Problems were presented and solved, code revisions and clarifications were suggested and interpretations of various code sections were discussed.

Subjects covered in the code clinics included the following:

A. Conductors in multiple—Section 3105 states that "Conductors in sizes 1/0 and larger may be run in multiple provided they are of the same length and have the same circular-mil area and type of insulation. . . ." But section 6205a-1. on elevator wiring permits use of "No. 20 or larger conductors . . . in parallel, provided the carrying capacity is equivalent to at least that of No. 14 wire." The question then arises—Does the code prohibit the use of multiple conductors per leg for sizes smaller than 1/0?

Some argued that what the code does not prohibit is allowed, provided there is no objection on engineering grounds. They felt that the

code does not specifically prohibit the use of multiple conductors smaller than 1/0. Others argued that the intent of the code is clear and has the effect of prohibiting multiple conductors in sizes smaller than 1/0, with 6205a-1. as an exception to the basic rule. A clarification was requested from the code-making panel responsible for that section.

B. Derating of conductors—The above discussion raised the question of derating conductors-in-multiple when more than three are used in a single conduit. The use of multiple conductors per phase in large capacity electrical circuits is based on the higher current carrying capacity per cross section area for smaller conductors compared with larger conductors. This derives from a higher ratio of circumference to cross section area as

conductor size is reduced. Since temperature rise is a function of heat dissipating area, a smaller conductor can carry more current per unit cross section before it reaches a given temperature because it has more heat dissipating area per unit of cross section area.

From all of this, two similar conductors in parallel can have a total current-carrying capacity equal to that of a single larger conductor but will have a total cross section area less than the larger conductor. As a result, more power can be delivered per pound of conductor.

The question then arises—if multiple conductors are used in a conduit and the total number of conductors exceeds three, is the advantage of multiple conductors penalized according to Note 4 to Tables 1 and 2 of the NE code? This is the derating requirement which reduces the allowable current carrying capacity of conductors when more than three are used in a single conduit. The answer to the question is "yes". The derating on the basis of conduit occupancy must be made. As in the case of any other conductors, a large number reduces ventilation and heat dissipating ability and causes temperature rise above normal if the normal current flows in the conductors.

RECOMMENDED RANGES OF PANEL-TYPE CIRCUIT BREAKERS TO RESTRICT INTERCHANGEABILITY

0—20 AMPS

21—50 AMPS

51—100 AMPS

It was also noted, in connection with the above, that conductors installed in wireway or auxiliary conductors are not subject to derating on the basis of occupancy. The advantage of multiple conductors can, therefore, be maintained if used in wireway instead of conduit. One member questioned the reason behind exempting wireway from the occupancy derating penalty. It was pointed out in answer that this exception is presently under review as part of an overall study on conductors in raceway. Of course, in the present code, the number of conductors in wireway is generally limited to 30 and the total cross section area of conductors must not exceed 20% of the interior cross section of the wireway. The heat dissipating area of the raceway surface is therefore larger than it would be with conduit, and internal ventilation is better.

C. Interchangeability of circuit breakers—At one of the code clinics, a motion was passed expressing the Eastern Section's support of restricted interchangeability of panel-type circuit breakers. The motion recommended three ranges of CB sizes—0 to 20 amps, 21 to 50 amps and 51 to 100 amps—for breakers rated up to and including 250 volts. The significant break is the one at 20 amps. According to such an arrangement (a similar one has already been incorporated in the electrical code in Chicago) 15- and 20-amp CB's in panelboards, for instance, cannot be replaced with units rated from 21 to 50 amps. This action is under consideration for inclusion as a requirement in the 1959 National Electrical Code.

D. Type S fuse—Another motion passed supports elimination of the fine print note after section 2452. This would have the effect of making the use of Type S fuseholders mandatory as holders for plug fuses rated 30 amps or less. Plug fuses and fuseholders of Type S are classified at 0 to 15 amps or 16 to 30 amps—at not over 125 volts. According to the code, the fuseholders should be so arranged or adapted that fuses of the 16- to 30-amp classification cannot be used in fuseholders or adapters of the 0 to 15-amp classification. And only Type S fuses can be used in fuseholders or adapters designed for Type S. Adapters for Type S application must be designed to be non-removable when installed in fuseholders.



A 3-phase circuit of three 2000 MCM type R conductors in a 6-in. conduit.
Current rating of each phase=560 amps.
Cross-section area per phase=3.2079 sq. in.



A 3-phase circuit of six 400 MCM type R conductors (two per phase) in a 4-in. conduit.
Current rating of each phase might appear to be
=2x280=560 amps
But, because of the 80% derating required by Note 4 to Table 1 in Chapter 10 of the NEC,
Current rating of each phase=560x80%=448 amps
Cross-section area per phase=1.6730 sq. in. (two conductors)



A 3-phase circuit of three 1000 MCM type R conductors in a 4-in. conduit.
Current rating of each phase=455 amps
Cross-section area per phase=1.7531 sq. in.



A 3-phase circuit of six 600 MCM type R conductors in a 5-in. conduit.
Current rating of each phase might appear to be
=2x355=710 amps
But 80% derating must be applied because of the number of conductors in the conduit.
Current rating of each phase=710x80%=568 amps
Cross-section area per phase=2.3880 sq. in. (two conductors)

NOTES:

- a. Without derating for conduit occupancy, circuit 2 would be equivalent to circuit 1.
- b. A circuit of six 400 MCM's can be made equivalent in current carrying capacity to a circuit of three 2000 MCM's by dividing the 400's between two conduits (3 conductors/3" conduit).
- c. Circuit 2 is almost equivalent to circuit 3 in current rating.
- d. Circuit 4 is equivalent to circuit 1 in current rating, but uses less conductor copper and a smaller conduit. And the advantages are obtained even with the occupancy derating.

CONDUCTOR DERATING is necessary for multiple conductors on the basis of conduit occupancy, but advantages of multiple conductors can be retained.

E. Tamper tool for Type S—A motion was made to send letters of protest to any manufacturers who make a small tool or gadget for readily removing Type S adapters from fuseholders. The consensus of opinion saw use of this tool as a negation of the safety sought by the code. The members seek removal of the device from the market.

F. Size of grounding conductor—It was noted by one member that there is some question about code requirements on carrying capacity of grounding conductors. According to section 2594a. of the code, the size of a grounding conductor for an ac system or for a common grounding conductor must be based

on the table in that section. Generally, it is taken that this grounding conductor requires at least 20% of the current capacity of the largest service conductor. In the case of a 1,100 MCM service conductor, for instance, the grounding conductor must be 2/0 or 3/0.

But then the question arises—Can this grounding conductor be connected to a water pipe which has a still lower current carrying capacity—such as a $\frac{1}{2}$ -in. water pipe? In answer, it was stated that there has been no experience with or evidence of harmful effects from such application. With such hookups, fault currents will flow over the grounding circuit and will accomplish safe grounding. Then, too,

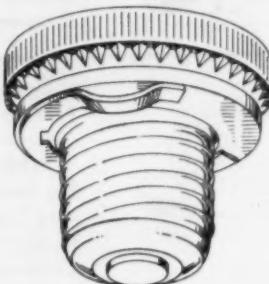
there is the problem of determining the current carrying capacity of a given size of pipe carrying water. It was decided to call this matter to the attention of the appropriate code-making panel.

G. Type RR cable—One questioner requested a correlation between Type RR cable and the approved cables listed in the code. The answer was stated flatly—"Type RR" is a manufacturer's designation and has no official counterpart in the code. Use of Type RR cable places the necessity for determining its code equivalent on the installer. It was stated that any inspector should insist on knowing the code designation for all cable installations he approves. The code makes no reference to Type RR. For any code enforcing authority, therefore, the designation "Type RR" as such means nothing.

In connection with this matter, it was noted that the code does not cover many other types of wires and cables which are in common use today. In particular, the code does not provide specific requirements for the use of the very many types of high voltage (above 600 volts) cables. Approvals for all such applications rest with the individual inspectors.

H. Wiring in continuous fixtures—When wiring end-to-end rows of lighting fixtures, is it necessary to use fixture (high temperature) wire for continuation of the branch circuit through the wiring channel? The answer was "No." The reason given was that fixture

MANDATORY TYPE S FUSING RESTRICTS INTERCHANGEABILITY



TYPE S fuse has a shank diameter smaller than standard Edison base



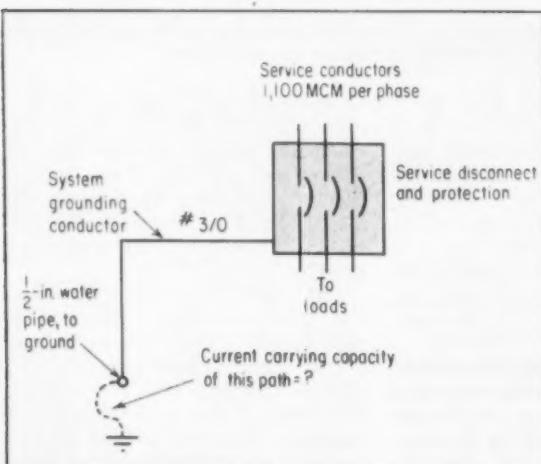
TYPE S adapter fits into Edison base cutout and takes Type S fuse rated for 0.5 amps or 16-30 amps

wire is approved only for wiring from fixtures to branch circuits but not for use as branch circuit wiring. The conductors used to carry the circuit through the continuous wiring channel must be standard building wire for general use. The wires from the fixtures are spliced to these circuit wires.

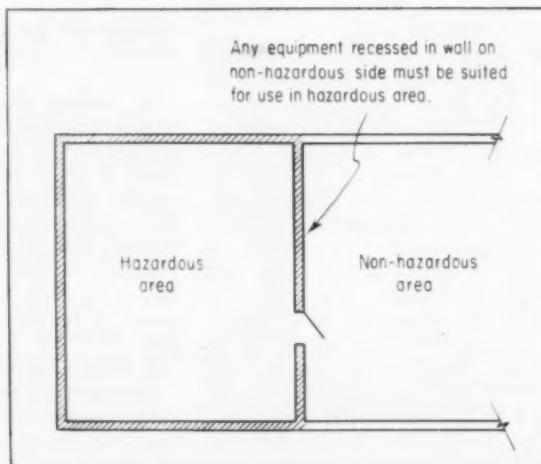
I. Walls bounding hazardous areas—All walls bounding hazardous areas are considered to be part of the hazardous area for their entire thickness. Any equipment recessed in such walls on the non-hazardous side is considered to be in the hazardous area and must be of construction suited to the particular hazardous classification. Any equipment surface-mounted on these walls on the non-hazardous side does not have to comply with requirements for the hazardous area. A rigid interpretation was placed on this matter. No matter how thick or how thin the walls are, the above applies. It even applies where a wall bounding a hazardous area is masonry on the hazardous side backed with studs, furring and a finished plaster wall bounding, say an office area, on the non-hazardous side. Any conduit or other electrical equipment recessed in a furred wall must be approved for the hazardous location.

J. Plastic raceway—A question was raised on the acceptability of plastic pipe as an electrical raceway. It was noted that the code does not cover use of such raceway and that no such raceway has been submitted to Underwriters Laboratories.

Another subject which came in for considerable discussion was code calculation of service capacity for residential occupancies. It was felt that the minimum on watts-per-square foot for lighting should be upped to cover later increases in appliance loads.



REQUIRED RATING of system grounding conductor is covered by NEC, but no ruling is made for current capacity of continuation of ground path through water pipe systems to ground.



WALLS BOUNDING hazardous areas are considered to be parts of the hazardous area for their entire thickness and equipment in such walls must conform to code requirements for the particular type of hazardous area.



"We used 40,000 feet of SPANG HD Conduit for the Rubberoid Felt Mill," states Mr. Dotson. "That's a good test for any conduit; and believe me, SPANG HD is tops. It's the easiest conduit to work with we ever installed."

"SPANG HD IS THE EASIEST-TO-WORK-WITH CONDUIT WE EVER USED"

says Mr. Bill Dotson, Sr., Dotson Electric Company, Savannah, Ga.

"We installed over 40,000 feet of SPANG HD Conduit in the new Rubberoid Felt Mill in Savannah. SPANG HD was easy to work with—easy to thread and bend. It is the fastest conduit to install we have ever used.

"The SPANG HD galvanized finish was excellent. Its ability to withstand outside storage for long periods of time was very good. Several of the inspectors of the finished conduit installation remarked on its shiny finish and clean appearance."

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That's because SPANG HD galvanized conduit is produced under quality-control conditions from skele to finished product and inspected thoroughly to assure you a top-quality, uniform product. Try it once, and you'll use SPANG HD regularly. See your local SPANG Distributor for your next order.

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General Contractor: Daniel Construction Company, Jacksonville, Fla.

Electrical Contractor: Dotson Electric Company, Savannah, Ga.

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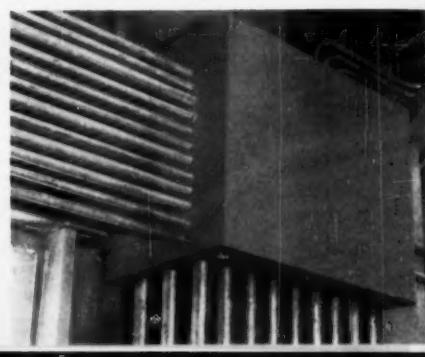
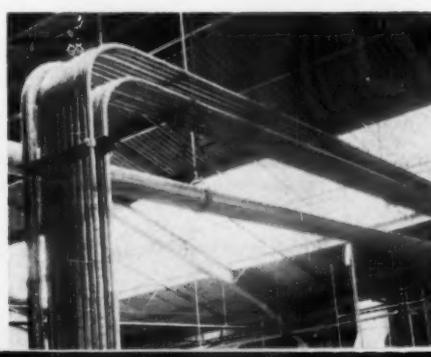
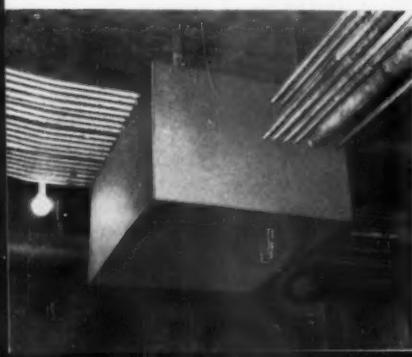
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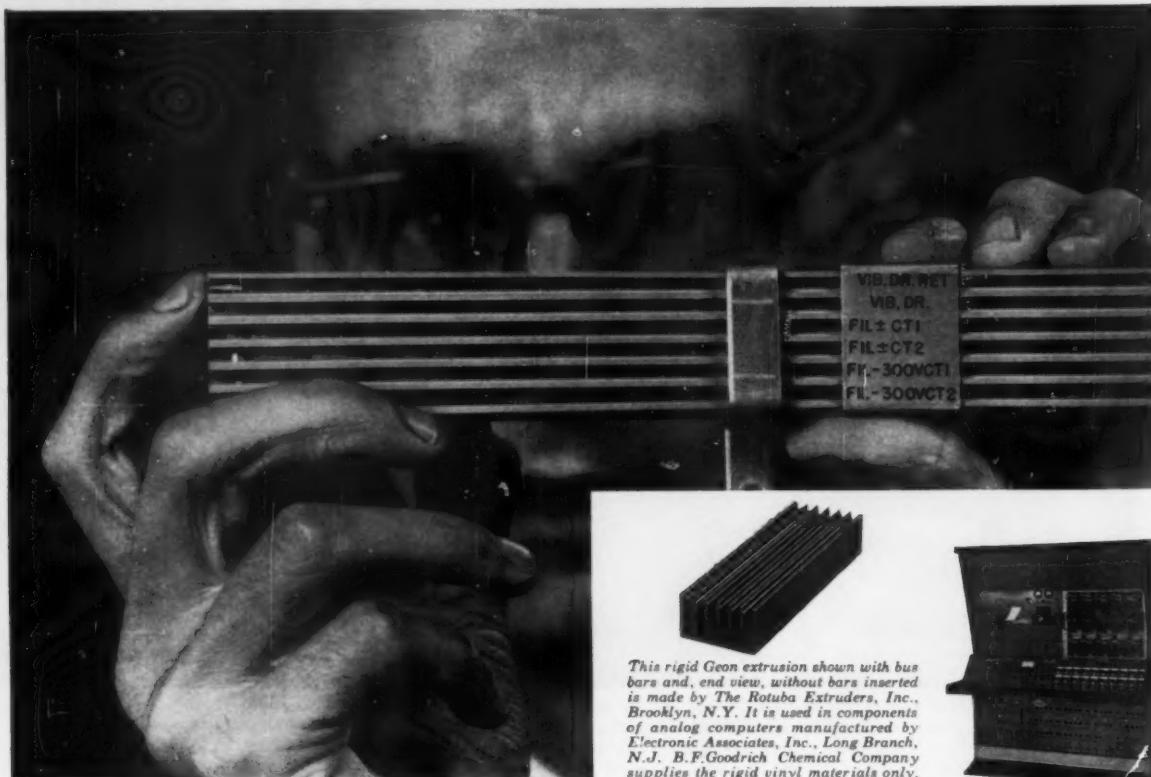
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Another new development using

B.F.Goodrich Chemical raw materials



This rigid Geon extrusion shown with bus bars and end view, without bars inserted is made by The Rotuba Extruders, Inc., Brooklyn, N.Y. It is used in components of analog computers manufactured by Electronic Associates, Inc., Long Branch, N.J. B.F.Goodrich Chemical Company supplies the rigid vinyl materials only.



Extrusion of rigid Geon

... cuts bus bar insulation costs, saves assembly time

This extrusion of Geon rigid vinyl material saves cost, time and space for electrical assemblies. It is used to retain and insulate six strip-type bus bars of varying voltages up to 600 volts DC. They can be placed closer together because of rigid Geon's high dielectric strength and high insulation value.

Rigid Geon brings material costs down, too, for this application. It also shortens assembly time and saves weight and space.

In addition, the use of extrusions made from Geon rigid vinyl material provides good chemical and abrasion resistance. If desired, they can be colored for coding purposes. It's another example of the way Geon rigid vinyl can be the key to a new or improved product or application. For information, write Dept. LS-6, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



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Motor Shops



HOLDING BOLTS are moved along yoke slot until they align with corresponding holes in motor frame. Hand-operated thrust shaft is then turned to force stator from its housing.

Slotted Yoke Simplifies Removal of Fractional Stators

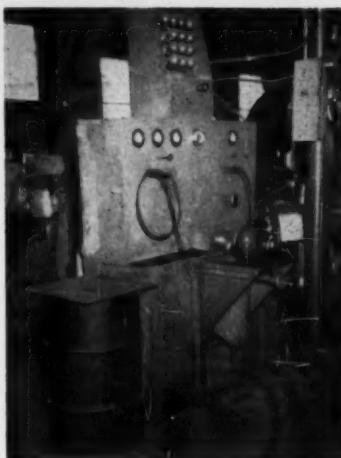
A simple tool for pressing stators in or out of fractional-hp frames is a shop-made rig developed by employees of the Wesley Jagger repair shop in Wilmington, Del. As indicated, the assembly consists of a slotted yoke equipped with a central, threaded, manually-operated thrust jack.

In use, long bolts are moved in or out along the slotted yoke until they line up with corresponding bolt holes in the frame. Then the bolts are spun down (to provide the yoke with a firm holding medium) and the jack bar is turned to exert pressure against the stator, forcing it either out or into its housing as desired. Since pressure on the stator is positive and even, this operation is performed in minimum time with minimum danger of damage to the motor.

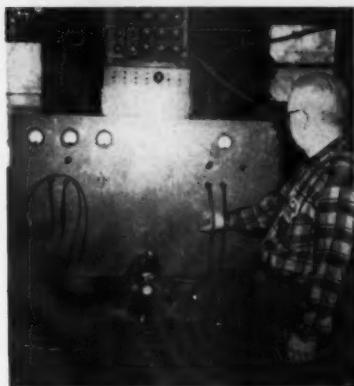
Simplified Motor Test Stand

A simply constructed device designed and put together by William R. Heimroth of Heimroth Electric and Machine Company, Terre Haute, Ind., simplifies the job of

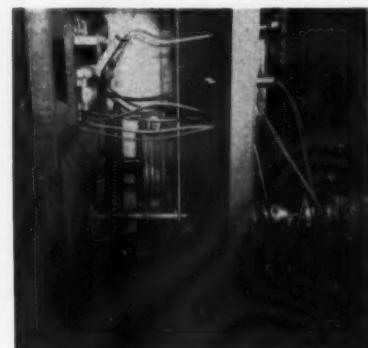
running various tests on motors, before and after repair. The unit is 5 ft high by 5 ft wide and is 12 ins. deep. It is made of a completely welded angle iron frame covered with $\frac{1}{8}$ -in. sheet metal. An adjustable table attached to the bottom front of the device raises or lowers motor being tested to align it with a 3-jawed universal chuck on the test shaft which chain-drives a load-brake. This enables the power delivered by the motor under test to be transferred via the chain drive to a 12-in. circular drum whose brake shoes have a micrometer adjustment that increases or decreases the amount of friction between the rotating drum and the brake lining of the shoes, thereby



OVERALL VIEW of motor test stand, shows adjustable table that aligns motor shaft with universal chuck on the test shaft, which chain-drives a load brake located inside the motor test stand. Bank of light bulbs located at top of device provides testing for grounds and short circuits. On right side of test panel are three motor test-lead plugs for 110/220 volt, single phase testing. On left side of panel are four motor test-lead plugs for 220/440 volt, two phase or three phase testing.



MOTOR SHOP OWNER William R. Heimroth is shown with the device he constructed to test motors before and after repair. He is turning panel knob connected to load-brake, which will increase friction between rotating drum and brake lining. Also, at the same time he is watching tachometer gauge that indicates full speed of motor under various loads.



LOAD-BRAKE inside test stand is air-cooled by multiple outer ribs on brake shoes that help to dissipate generated heat. The inner drum of the brake is chain-driven from power supplied by the motor under test.

creating varying basic load standards for motors of different ratings.

The load brake, which is set according to the ampere reading on the nameplate of motor being tested, is of air-cooled design. Two 4-in. wide steel shoes have multiple outer ribs to help dissipate generated heat. These shoes, lined with conventional brake lining, are hinged at the bottom and have a bevel gear and threaded bolt attachment at the top. Turning the panel screw knob in one direction tightens the shoes about the chain-driven drum to apply load in small increments. Reversing knob rotation releases the brake and load from the motor under test.

With the motor running and the adjustable pressure bolt taken up to increase friction between the rotating drum and the brake lining, a tachometer gauge on the front control panel of the device indicates full speed of motor under various loads. The gauge also indicates when starting windings function, or, on repulsion type motors, indicate at what speed brushes leave the commutator. Motors are tested from a no-load condition to their stalling point, with the mechanism



Revere Poles for Floodlighting

1. Square hinged poles (199-G Series) in 18, 20 and 24-foot mounting heights for 1 or 2 general purpose floodlights. Made of seamless steel tubing, with 2½-inch upper section, 3-inch lower section. Pole tops have 2-inch threaded nipples for brackets.

2. Heavy duty square tapered hinged poles (199-E Series) in 20 and 24-foot mounting heights, for 1, 2 or 3 floodlights. Tapers from 2½ inches to 4½ inches. Base has 8-inch bolt circle. Pole tops have 2-inch threaded nipple for floodlight mounting brackets.

3. Heavy duty square tapered hinged poles (199-D Series) in 30-foot mounting height for 1, 2 or 3 floodlights. Tapers from 2½ inches to 5½ inches. Base is made of cast steel, welded in position, and has 11-inch bolt circle. Pole tops have 2-inch threaded nipple.

4. Extra heavy duty hinged poles (No. 199-DB Series) in 30-foot mounting height, for the Ultra-Lite Luminaire or floodlights up to 180 lbs. Tapers from 3 inches to 5½ inches, has 11-inch bolt circle. Pole tops have 10-inch long (3-inch dia.) threaded pipe stub.

5. Octagonal tapered rigid poles (560 Series) in 20, 25 and 30-foot mounting heights for 1 to 5 mercury or incandescent floodlights. Made of 11-gauge Cor-Ten steel. Tapers from 3¾ inches to 7 inches. Pole tops furnished with 2 or 3-inch threaded nipple.

6. Rigid poles (115 Series) in 20 to 60-foot mounting heights, for up to 10 floodlights. Made of standard steel pipe in separable lengths of 22 feet or less. Pole tops have 3-inch threaded pipe stub. Poles available for base and bolt mounting or concrete mounting.

Write for catalog of Revere outdoor lighting equipment

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capable of reproducing conditions equivalent to approximately 500% overload. And from three ammeters, that are always in circuit, it is also possible to tell if each phase is pulling its correct load.

Four banks of light bulbs located at the top of the device provide testing for grounds or short circuits. Test voltages range up to 5000 in steps of 500 volts.

Perforated Pipe Produces Multiple Burning Jets

Burning the insulation of stator windings prior to stripping of coils is accomplished in the Lange Electric shop in Baltimore through the use of a vertical pipe section connected to a gas supply. When gas is turned on and ignited, jets are directed outwards in all directions and at all heights, so that, when a stator is placed over this pipe section, the flames are concentrated on the surfaces in question.

Since the table top through which the pipe protrudes is constructed of firebrick and since the stator rests upon two angle-iron supports, safety against bench-burning is promoted and stators can easily be gripped by tongs that slide beneath, as well as above, the rim of the stator.



VERTICAL AND CAPPED section of perforated pipe, protruding upwards through fire-brick bench top, delivers multiple gas jets to interior surface of motor stator, thereby concentrating flames against insulation of coils to be burned and stripped from the frame.

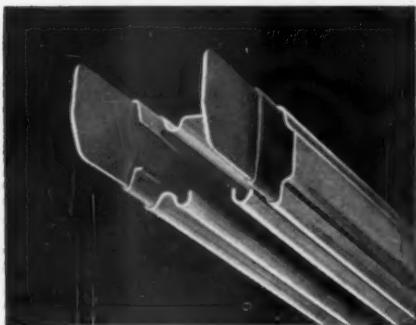
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Listed by Underwriters' Laboratories, this new Universal Lighting System assures maximum flexibility at minimum cost. Check its many advantages. Consult your electrical distributor or BullDog field engineer. Or write BullDog Electric Products Co., Detroit 32, Michigan.

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CROSS SECTION of new, low-cost 20-amp Universal Lighting System. Movable weight supports and twistout plugs speed rearrangement, addition or removal of fixtures, eliminate rewiring and electrical downtime.



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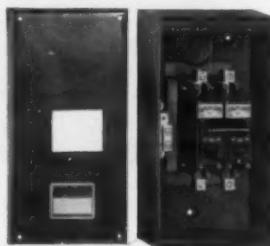
Successful, because the Heinemann circuit breakers inside employ the most dependable type of operation ever devised . . . hydraulic-magnetic actuation. Heat never affects the rating of the Heinemann magnetic sensing coil . . . you can locate the breakers next to steam pipes if you have to. Hydraulically-controlled time delay prevents nuisance tripping.

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- Has 8 knockouts.
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- Heavy-gauge steel, grey baked-on enamel.
- Listed by Underwriters Labs, Inc.



Want more information? It's available in Bulletin 1000, a handy 24-page, illustrated catalog of the entire Heinemann enclosed equipment line.

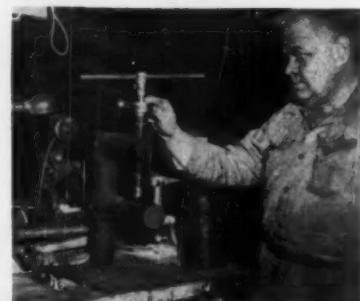
**HEINEMANN
ELECTRIC COMPANY**
132 Plum Street Trenton 2, N. J.



S.A. 1728-A

Concentric Screwdriver Removes Gasing Bolts

An "F" frame, constructed from short lengths of 2 $\frac{1}{2}$ -in. piping and mounted on a steel base plate which in turn is bolted to a bench top, is equipped with two concentric bars that facilitate the removal of pole screws from generator housings. As indicated, the outer (hollow) bar is a jack that can be lowered to securely hold the generator case on



SHORT SECTIONS OF PIPE, welded together and capped to form an F frame, are equipped with two coaxial bar assemblies as indicated in this photo. In removing pole screws from generator housings . . .

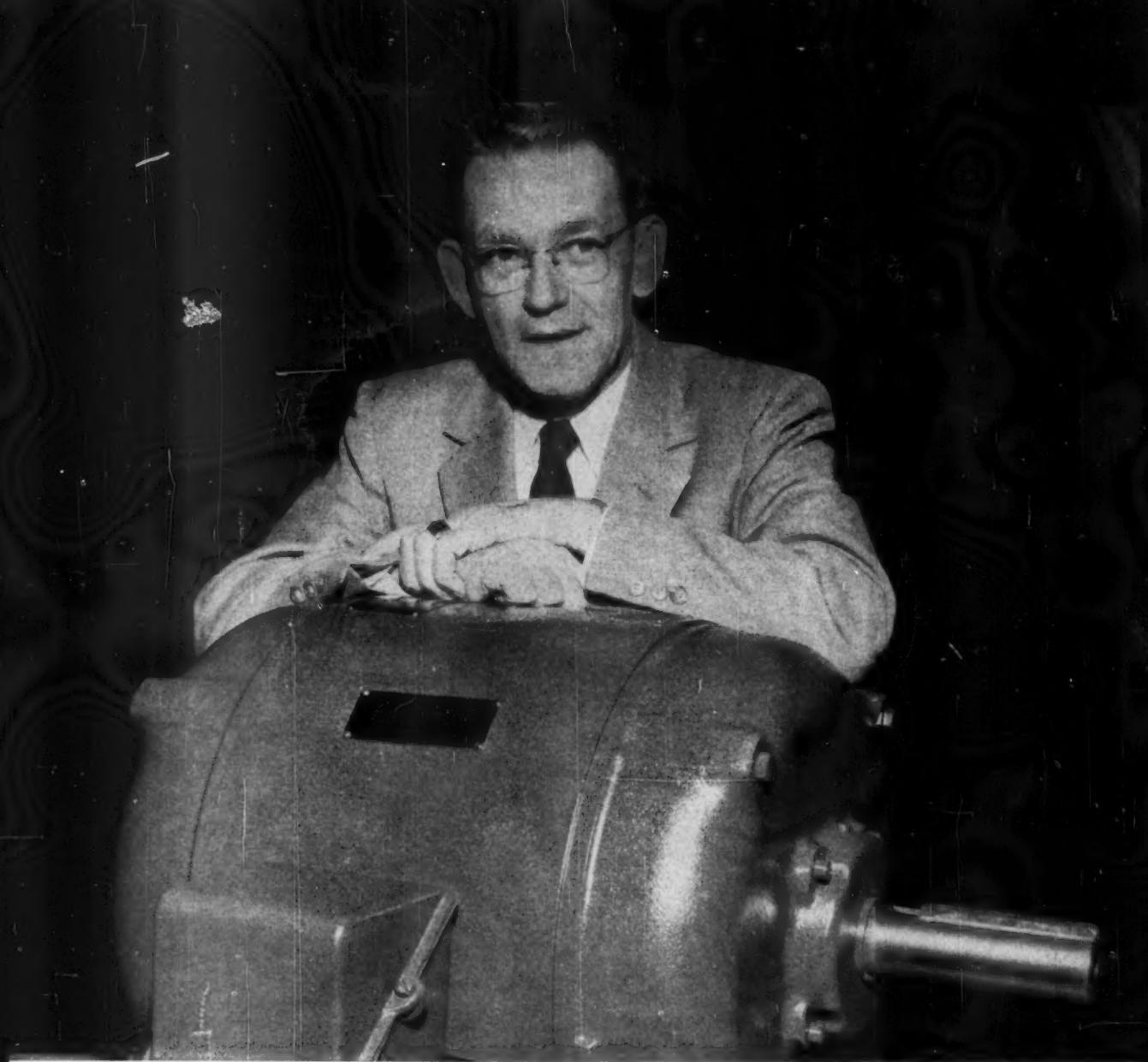


THE GENERATOR HOUSING is slipped over the lower horizontal pipe section, the outer jack assembly is lowered to hold it firmly, then the inner screwdriver is turned to remove the screws.

the lower of the two horizontal arms. The inner bar is then lowered and spun to remove the bolts.

Sufficient clearance exists between the lower piping of the F-frame and the metal base plate to accommodate the range in generator sizes normally encountered in the shop.

This method, devised by Eston Riles, Jr., owner of Riles Armature Winding in Roanoke, Va., prevents the casing and screwdriver from slipping, thereby insuring flush, firm bearing and torque surfaces, preventing marring of housings or need of screw replacements.



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individually enclosed LOW VOLTAGE BREAKERS



If you're setting
the trip device
or making
inspection...



Get a long look in a short time

simply removing
deep front
cover



The deep cover is the *not-so-deep* secret of safe, easy adjustment and inspection of Allis-Chalmers individually enclosed low voltage breakers. The entire breaker can be inspected without removing it from its position.

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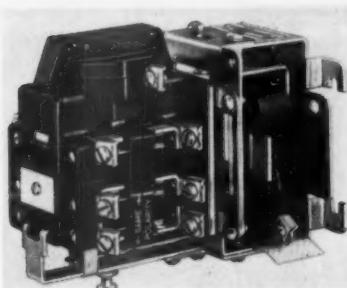
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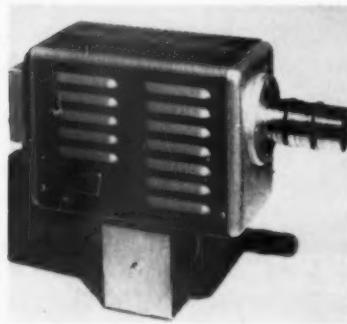
Product News



Control Relay (1)

A new line of mechanically held control relays, Type D, rated at 10 amps, 600 volts. Both mechanically and electrically held relays can now be mounted on the control panel in the proper sequence. Available in a variety of units up to ten contacts. Bulletin SM-278 is available.

Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.



TV Camera (2)

A completely self-contained, automatic television camera for industrial, military and educational applications. Designated Model 63A, it automatically accommodates a light range of 120 to 1, with 50% change in video output level. It automatically self-adjusts beam, target and electrical focus circuits to optimum values. It is supplied in a case measuring 6½ ins. high by 6½ ins. wide by 11½ ins. long.

Dage Television Division, Thompson Products, Inc., Michigan City, Ind.

Conduit Fittings (3)

"Speedolet" thinwall fittings are now available in conduit sizes from ½ in. through 2-in. They can be installed quickly and permanently by tightening set screws.

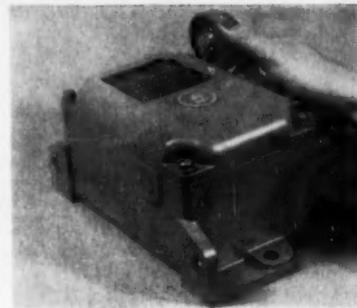
Killark Electric Mfg. Co., Vandeventer and Easton, St. Louis 13, Mo.

Duplex Outlet

(3a)

New line of caps and receptacles provides positive grounding plus "Twist-Lock" protection. It is designed for 3-wire, 15-amp, 277-volt circuits, used for fluorescent lighting. A special configuration guarantees non-interchange with regular "Twist-Lock", 4700 line or any other devices on the market. This duplex outlet can be used to feed two fluorescent lighting fixtures from one single gang box.

Harvey Hubbell, Inc., Bridgeport 2, Conn.



Duplex Outlet (3a)



Limit Switch (6)

Type HDH hatchway limit switches for industrial, marine and naval use. They embody one or two cam-opened, spring-closed, slow acting switching elements. Industrial switches are available in a general purpose weatherproof enclosure, a dust-tight enclosure, or a watertight enclosure. A companion line of naval and marine switches will be available for industrial use in explosive atmospheres. Switch is rated up to 600 volts at a maximum continuous current of 25 amps, ac or dc.

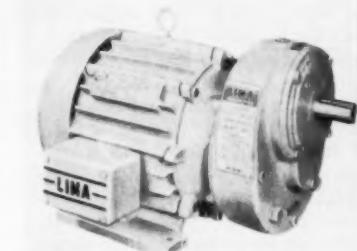
Westinghouse Electric Corp., Pittsburgh 30, Pa.

Electric Heater

(4)

A new ceiling mounted Chromalox electric radiant comfort heater, suitable for general application. Designated Type SKR, heaters are equipped with two fixture stems which provide minimum 12-in. spacing below combustible ceilings. Each stem has a canopy and fixture for attachment to standard conduit box. It may be used for "spot heating" in problem areas or for heating of entire rooms—as supplemental or as sole heat source. Listed by UL and is available in six heated lengths; 16½, 22½, 38½, 55½, 65½ and 78 ins.; with these corresponding ratings: 800, 1100, 1800, 2500, 3000 and 3600 for operation on all standard voltages.

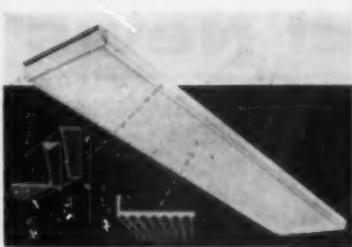
Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa.



Gearmotors (7)

New line of gearmotors consists of single, double and triple reduction units, integrally motor mounted, with duty-rated lifetime gearing. Motor capacities are rated from 1 to 125 hp, with output reduction speeds from 780 to 7½ rpm. They are adapted for horizontal foot mounted applications. Available in standard open dripproof construction for general purpose use; totally enclosed fan-cooled for dusty or high humidity atmospheres and explosion-proof for hazardous locations. Standard electrical characteristics are: normal torque, two- or three-phase, 60-cycle, 208, 220/440 or 550 volts.

Lima Electric Motor Co., Inc., Lima, Ohio



Lighting Fixture

Switches

(11)

New single pole and 3-way push-button type ac switches with built-in locator lights for use in homes, institutions, commercial and industrial buildings. They fit standard wall boxes and take standard wall plates. Switches have pressure-lock terminals which permit looping of wires. UL listed for full 15-amp capacity for tungsten filament and fluorescent lamp loads and up to 80% capacity for motor loads.

General Electric Co., Wiring Device Dept., Providence 7, R. I.

A new commercial lighting fixture, C-2, is similar in appearance and construction to the Catalina, but incorporates a newly designed plastic lens. Designated as L-120, this polystyrene pyramid pattern lens is offered in place of the Catalina 45°louver. A polyethylene plug closes the ends of the side panels making them dust-proof and bug-proof. They may be installed singly or in continuous lines.

Benjamin Electric Mfg. Co., Northwest Highway, Des Plaines, Ill.

Wiring Devices

(9)

A complete new line of combination wiring devices for new construction or rewiring incorporates the use of dual pressure-lock terminals that permit looping of conductors. Terminals are enclosed and marked for positive identification. All devices have adjustable ears. Each device features break-off link connecting the two switches to provide a common feed, and/or separate feed if desired. Pilot light uses an extra-long life neon lamp and outlets have double wire contacts. All devices use standard outlet plates.

General Electric Company, Wiring Device Department, Providence 7, R. I.

Fluorescent Light

(10)

A new, ultra-shallow, surface-mounted, fluorescent lighting unit, called "Little Inch", is specifically designed for supplementary kitchen lighting. A wrap-around, translucent plastic diffuser makes possible comfortable, unobtrusive lighting. Lamp operation may be by push-type switch or starter. For large work counters, several units can be mounted in continuous runs, all operated by one wall switch. Dimensions of unit are 12½ by 5 by ½ ins. For servicing and relamping, diffuser snaps out with thumb pressure.

Alkco Mfg. Co., 4242 No. Lincoln Ave., Chicago 18, Ill.

Secondary Racks

(12)

New one piece, 3-wire, extended secondary racks furnished with either 8- or 12-in. wire spacing. They are hot-dip galvanized for protection against corrosion. They feature one-piece integral construction and individual clevis pins that eliminate separate spool clevises and simplify installation of insulators.

Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.



Conductor Systems

(13)

New 1000-amp Hevi-Bar conductor systems of mobile electrification are designed specifically for heavy duty applications. It can be installed as an open (bare conductor) system, or as an enclosed (safety) system. Hevi-Bar consists of three basic components: aluminum conductor bars, sliding shoe trolley collectors, and hanger clamps. When used as a safety-type system, the conductor bars are enclosed in specially compounded PVC plastic covers. Conductor bars, available in 10- and 20-ft sections, are welded together in the field by the Cadweld process. Catalog No. 5-58 is available.

Insul-8-Corp., 1369 Industrial Road, San Carlos, Calif.



by **GENERAL**
SWITCH
COMPANY



*a new
manufacturing
idea, offering the
electrical contractor
all the advantages
of fusible
and expandable
service entrance
equipment!*

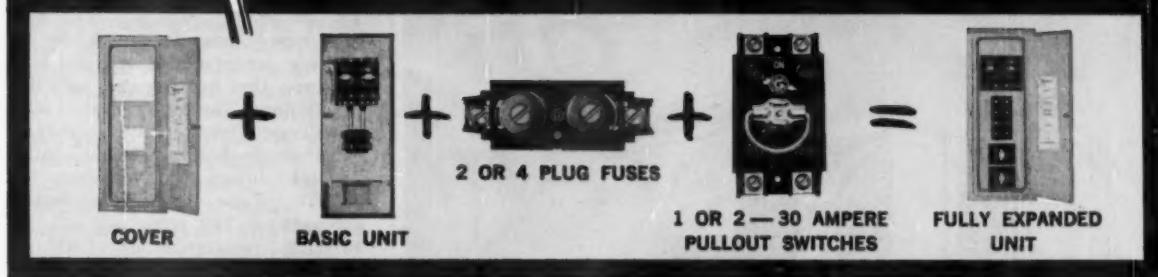
THE SWITCH IS TO GENERAL



GENERAL SWITCH COMPANY

presents

PLUS PANELS



NEW PLUS PANEL CONSTRUCTION PROVIDES EXPANDABLE SERVICE ENTRANCE EQUIPMENT

FOUR BASIC CATALOG NUMBERS, each 100 Amp. main rated, provide adequate service for immediate use and reserve facilities for housepower to be added later.

CAT. NO. 2514: "Main-Range and Four" with reserve housepower to add four lighting circuits.

CAT. NO. 2518: "Main-Range and Eight" with reserve housepower to add two or four lighting circuits.

CAT. NO. 518: "Main and Eight" with reserve housepower to add up to four lighting circuits and also two appliance pullouts.

CAT. NO. 5518: "Main-Range and Eight" with reserve housepower to add up to four lighting circuits and also two appliance pullouts.

THE SWITCH IS TO GENERAL

WRITE FOR PRODUCT DATA BULLETIN NO. 135.



GENERAL SWITCH COMPANY

DIVISION OF NORBUTE CORPORATION

45 ROEBLING STREET • BROOKLYN 11, N. Y.

MANUFACTURERS OF ENCLOSED SAFETY SWITCHES • SERVICE ENTRANCE EQUIPMENT • BRANCH CIRCUIT PANELS



New house? Old house?

...for every room in any house

CHROMALOX has the answer

Upstairs, downstairs, all through the house . . . or school, church, motel or office . . . there's a Chromalox Electric Heater designed for the heating job.

Popular Chromalox Electric Baseboard Heaters are available in many sizes and ratings, with matching blank, corner and trim sections for a uniform, neat appearance.

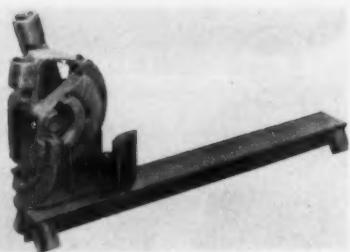
Chromalox Radiant Wall Panels, Wall Insert Heaters and Cabinet Convectors provide abundant heat to meet a variety of other heating requirements and decorating tastes.

Chromalox Floor Drop-In Heaters quickly solve heat loss problems caused by "picture" type windows.

Chromalox Utility Spot Heaters and Port-

ables concentrate heat where and when it's needed for laundries, home workshops, garages and other small, occasional-use areas.

In addition to all these, the Chromalox line includes unit ventilators, fan driven heaters, Thermwire heating cable, in-duct heaters, and others. Chromalox offers you: good profits, customer satisfaction, nationwide distribution, and local Chromalox engineering assistance. Write now, or call your Chromalox "Man with the Answers."



Bender

(14)

Ratchet action for easy bending is featured on the No. 1800 hand bender for $\frac{1}{2}$, $\frac{3}{4}$ - and 1-in. rigid conduit and pipe. Unit makes smooth, accurate bends to 90°. Built-in bending gauge reads 0° to 90° to facilitate bending to specification or making duplicate bends. A swingaway pipe clamping device makes loading easy. Ratchet release is located on top. Unit's T-iron base gives stable operation on bench or floor; base also receives 1½-in. pipe legs of any length. Bulletin is available.

Greenlee Tool Co., Rockford, Ill.

Rubber Tape

(15)

A new Class H, completely inorganic, unsupported silicone rubber tape, that handles and feels like plastic tape. The tape is coated with a silicone thermosetting pressure-sensitive adhesive. It is called "Scotch" brand electrical tape No. X-1070. Tape has a dielectric strength of 700 volts per mil, insulation resistance of 1,000,000 megohms, arc resistance of 135 seconds and elongation of 600%. Tape is available on a 1-in. core in 18-yard lengths.

Minnesota Mining and Manufacturing Co., 900 Bush St., St. Paul 6, Minn.

Voltage Stabilizer

(16)

A redesigned line of constant voltage stabilizers incorporates automatic overload or short circuit protection when load current is increased in excess of normal operating load. Voltage fluctuation caused by inductive surges, switching arc-overs or other momentary voltage variation is corrected in $\frac{1}{2}$ cycle or $1/30$ of a second. Output voltage stabilization is obtained by a parallel combination of a fixed capacitance and a magnetic core inductance. In addition to standard 120-volt and 240-volt outputs, units are available for 6.3-volt output. Capacities range from 15 to 2000 va.

Acme Electric Corp., Cuba, N. Y.

House Number (17)

A newly designed lighted house number frame with built-in door bell button. Plastic numbers and spacers provided with frame allow users to arrange whatever number is required. Frames can be mounted vertically or horizontally. Where desirable a house occupant's name can be inserted in the frame in place of the numbers that are provided. It can be installed in place of or in addition to any button that uses 10 to 16 volts of electricity. Two leads are required for both the light and bell button.

General Electric Co., Wiring Device Department, Providence 7, R. I.

Circuit Breakers (18)

Individually enclosed models of the new K-line low-voltage power circuit breakers feature "visible break" design. Features of the metal enclosed U-Re-Lite models feature exposure of breaker by removing front cover; access for making cable connections; any standard lugs can be used in making cable connections. The units, rated at 600 volts in 225-, 600-, and 1600-amp frame sizes, are for service-entrance and single-circuit requirements in commercial buildings, industrial plants and power stations. K-line includes a new motor-driven, stored-energy system for electric closure, easily interchangeable overload trip devices and sub-assembly construction.

I-T-E Circuit Breaker Co., 1900 Hamilton St., Philadelphia 30, Pa.



Light Panel (19)

A Fiberglas polarizing light panel employs reflected and refracted polarization to achieve brightness control and uniform light distribution. The new material operates on the principle of selective reflectance and diffusion. It is produced in flat sheets, and consists of color-stable resin reinforced with Fiberglas flake. The flat sheets are available up to 24- by 48-in. in size.

Owens-Corning Fiberglas Corp., 16 East 56th St., New York 22, N. Y.

EFFICIENCY IS HIGH

when your tool is a



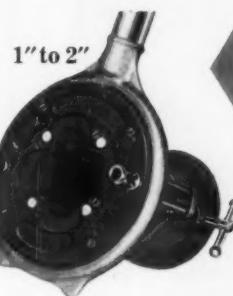
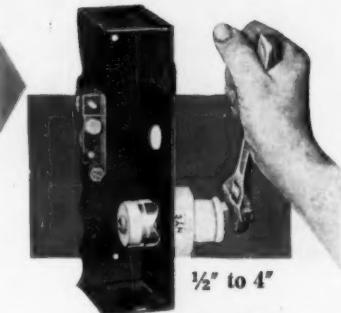
Fifty years of know-how are behind its design and construction. NYE tools are known the world over for dependable performance. What's more, NYE tools are all guaranteed.

Original 4 POINT

KNOCKOUT PUNCH

Hand or Hydraulic Operated

Fastest burrless punch on the market. Easiest to use, slugs drop out without prying.



1" to 2"

NYE 51B RATCHET PIPE THREADER

Has all the important features. ORIGINAL JAMPROOF DESIGN. Fast rewind knob. Ask for demonstration.



1/8" to 2"

NYE 2NP HEAVY-DUTY PIPE CUTTER

Self aligning—eliminates spirals because of original out-rieger design. Note: Long sleeve for protecting thread of tool when using a power unit.



5 NEW PIPE VISES

with built-in bender and pipe rest.

Full range of sizes 1/8" thru 4 1/2".



Write for NYE catalog showing the complete line.

NYE TOOL COMPANY
4126 W. Fullerton Ave.
Chicago 39, Illinois

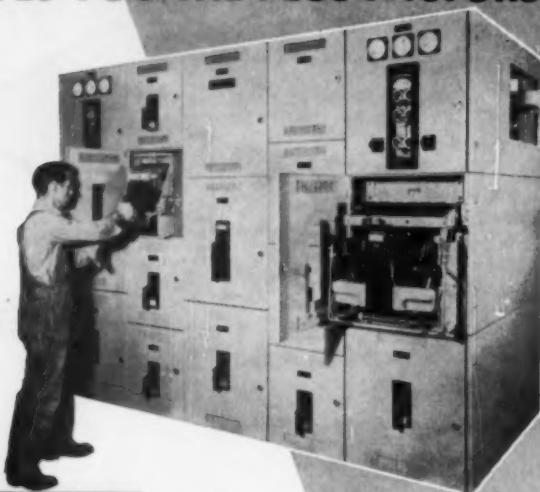
Name _____
Company _____
Address _____
City _____ State _____



NYE TOOL COMPANY

4126 WEST FULLERTON AVE., CHICAGO 39, ILLINOIS

NELSON LOW VOLTAGE SWITCHGEAR GIVES YOU THE PLUS FACTORS



CONVENIENCE

Nelson Class 722 Low Voltage Switchgear is completely assembled and tested at the factory before shipment. Field hook-up is fast and simple. All control terminations are located at the point of entrance of control conduits. All control and instrumentation fuses are mounted on the bus compartment door where they are readily accessible.

SAFETY

Completely dead front. Breaker compartments are separated from each other and from bus compartments by full barriers. Fuse replacement on the door of the bus compartment eliminates entering main bus compartment.

VERSATILITY

Versatility in choice of components such as breakers, power transformers and instruments. You choose the make you wish to use.

*a major source of
electrical control equipment
for industry*

NELSON Electric MANUFACTURING CO.
TULSA, OKLAHOMA



For additional information on
Nelson Class 722 Low
Voltage Switchgear write
for Bulletin 722.

Lighting Fixture

(20)

New quick-disconnect vaportight lighting fixture, Type VNF, can be installed and removed in seconds. Weather-proof receptacles can be installed in a number of convenient locations, indoors and outdoors, and fixture carried by maintenance personnel from one location to another. Fixture is inserted in receptacle when in use, and removed when not needed.

*Crouse-Hinds Company, Syracuse
7, N. Y.*

Light Bulbs

(21)

An expanded line of "Extended Service" light bulbs for high voltage service has been announced. Made with a 230 to 250 range voltage, the bulbs have a 2,500 hour life and will be available in a range from 100 to 1,500 watts. Designed especially for use in hard-to-get-at locations, the 2,500 hour life has been selected as the most economical design for the industrial user.

*Westinghouse Electric Corp.,
Bloomfield, N. J.*

Pushbutton Covers

(22)

Oil-tight pushbutton covers are used for flush mounting oil-tight pushbuttons over cavities in machinery or walls. Ten standard sizes accommodate from 1 to 25 pushbuttons or pilot-lights. The Universal holes will accommodate any standard make of oil-tight pushbutton. Covers are made of 14-gauge steel and have sponge neoprene gasketing around the inside edge to keep out oil and dust when covers are screwed into place.

*Hoffman Engineering Corp.,
Anoka, Minn.*

Insulator

(23)

A new 2½-in.-high standoff insulator, labeled Part No. 1461, is made for bus, contactor and switch support work. High impact strength is one of the features of the new corrugated-type insulator. It is molded from Glastic UMG 1500 compound which is recognized by UL for the sole support of current-carrying parts within electrical equipment when exposed to temperatures up to 150°C. It is presently used in a variety of insulating spacing and bus support applications at voltages up to 5 kv.

*Glastic Corp., 4321 Glenridge
Rd., Cleveland 21, Ohio.*

Angle

(24)

Hot dip galvanized angle comes in 12- and 14-gauge weights and 10- or 12-ft lengths to design and build custom steel structures. Product is punched with spaced holes and slots that it may be cut to any length and bolted together. Bolts and nuts are furnished with angle. Idea Book No. 299 is available.

Equipto, Aurora, Ill.

Duplex Receptacles

(25)

Combination duplex devices incorporating the Quiet switches. In the 5200 Series are a single pole Quiet switch, 15-amp, 120 volt, ac with power outlet rated 15 amp, 125 volt; a single pole with pilot light rated 75 watts, 125 volts; and two single pole on same circuit rated 15-amp, 120-277 volts, ac. Literature is available.

Leviton Manufacturing Co., Inc., Brooklyn 22, N. Y.

Outlets

(26)

Two new deluxe flush power outlets for both 30- and 50-amp receptacles. They are used in wiring electric range, dryer and industrial installations, both indoors and outdoors. Slidable back plate completely covers terminals for protection against arcing or shorting. Pressure type terminals prevent possibility of wire loosening and will accommodate up to No. 6 wire.

Bell Electric Co., 5735 S. Claremont Ave., Chicago 36, Ill.

**Fluorescent Fixture** (27)

New round, recessed, fluorescent series in 24-, 36- and 48-in. diameters with concave matte finished plexiglas diffusers. Fixtures are designed so face appearance is circular, the housing itself is square to accommodate four, six, or eight fluorescent lamps. The frame-within-a-frame construction of the face assembly is clean with no fasteners or screws showing, and hinged inner frame and Plexiglas mounts by means of Twist-Lock feature. Literature is available.

Neo-Ray Products, Inc., 315 East 22d St., New York 10, N. Y.

CHASE tapes stick around longer!

You can count on slick-sticking Chase Friction, Rubber, Plastic, Neoprene and Butyl Tapes to hold fast under toughest conditions. Modern Saran Wrap* packaging keeps every roll factory fresh . . . assures perfect adhesive qualities on job after job. See for yourself . . . order several rolls through your wholesaler today.

Chase & Sons Inc., 26 Spruce Street, North Quincy, Mass.

*Trademark of The Dow Chemical Company for its vinylidene chloride copolymer film





Here's a cable supporting system with space reserved for future needs

Cope cable trough gives your system room for growth!

Cope cable trough design gives you greater load carrying capacity per dollar now—plus built-in system expansibility that will minimize the cost of future system expansion. A single 24" wide section of Cope cable trough supports as many cables as 16 lengths of 4" conduit. Additional cables can be quickly and easily laid in existing trough as new equipment installations require. The lower first cost of a Cope cable trough installation saves you money a second time when you need to increase or expand your power distribution system!

Reduced System Maintenance Costs. Easy-to-get-at Cope cable trough also eliminates costly maintenance problems down the line. Once cable is laid in Cope expanded metal trough, it's readily accessible for easy inspection, repair . . . or re-routing when system

changes are required. And greater installation flexibility of lightweight Cope cable trough and a complete line of system accessories and fittings reduce design time up to 25% for laying out the most complicated system . . . assure easy system maintenance even in the most cramped quarters.

Cut Costs Three Ways. You save three ways when you specify Cope cable supporting systems with pin-type coupler . . . trough, ladder or channel.

- LOWER FIRST COST
- LOWER INSTALLATION COSTS
- LOWER SYSTEM MAINTENANCE COSTS

Discuss these advantages for your installation with a qualified Cope representative—or write to T. J. Cope Division, Rome Cable Corporation, Collegeville, Pa.



Ceiling Heater (28)

A new ceiling mounted electric bathroom heater, Model CH-121 is for flush-to-ceiling mounting. It is UL approved for surface mounting to a standard 3- or 4-in. junction box, with or without a plaster ring. A neoprene gasket on the rim conforms to any irregularities of the ceiling surface. Heater is corrosion proof because of its stainless steel rim and aluminum grille and reflector. CH-121 is a 1250-watt heater and operates on 120-volt, 60-cycle ac. Diameter of heater is 14½ ins. over the gasket.

Thermador Electrical Manufacturing Co., 5119 District Blvd., Los Angeles 22, Calif.

Ballasts (29)

A new fluorescent lamp ballast that is mounted outside the raceway of fluorescent lamp signs, with wires enclosed. Leads come out the bottom of the case and go directly into the raceway. Ballasts have all nameplate data stamped on the case. They are available for 800, 1000, 1400 and 1500 ma lamps.

Jefferson Electric Company, 25th and Madison Sts., Bellwood, Ill.

Lighting Control (30)

A new tubeless photoelectric lighting control, Series 6600A. Features include ac operation, hermetically sealed cell; built-in expulsion type surge and lightning protection; delayed circuit response to prevent false operation due to lightning. Electrical specifications include 1000-watt load rating; supply voltage 105-135 volts, 50/60 cycles; inrush current rating 100 amps; power consumption less than 0.5 watt average. It is housed in a weatherproof plastic case and fitted with a 3-prong Twistlock plug. Series includes six models for various pole, cross-arm, standard top and luminaire mounting requirements. Literature is available.

The Fisher-Pierce Co., 67 Pearl St., So. Braintree 85, Mass.

T. J. COPE Division
ROME CABLE CORPORATION

IT'S BUILT RIGHT- IT WORKS RIGHT- IT'S PRICED RIGHT



The Cutler-Hammer Midget Switch

Many electricians are now using this amazing Cutler-Hammer 4151 Midget Safety Switch wherever low cost circuit protection and control of electrical equipment is required . . . oil burners, air-conditioners, fans, automatic washers and dryers, home workshop power tools, blowers, and stokers are typical examples. Try a 4151 on your next job and you will agree this midget safety switch is built right, it works right, and it's priced right.

It's built right—Everyone is quick to appreciate the 4151's compact design, but of equal importance is its ease of installation. The one piece switch-and-fuse unit is removable by two screws for 3-point mounting of the enclosing case, speedy conduit connections, and wire pulling freedom. All terminals are out-front . . . no more skinned

knuckles or wire "pretzel" bending.

It works right—Cutler-Hammer's 4151 Midget Safety Switch has solid silver, double break, butt type contacts. Silver contacts will outlast contacts of copper or bronze. Double break contacts have greater contact area and halve the arc voltage. Butt type contacts meet face-to-face and receive only a fraction of the wear common to other designs.

It's priced right—The 4151 is a quality safety switch, yet the price range is the same as the cheapest switches made.

Order your 4151 safety switch from your nearby Authorized Cutler-Hammer Distributor today, or write for the Cutler-Hammer Merchandiser, ES-100-Y241, the handy selection guide. CUTLER-HAMMER Inc., Milwaukee 1, Wisconsin.



4151H241 30 Amp.
2 wire S/N; 1 Fuse.
120 A-c. $2\frac{1}{2}$ " x $5\frac{1}{8}$ "
x $2\frac{1}{4}$ ". List: \$5.00



4151H201 30 Amp.
2 Pole; 2 Fuses.
120/240 A-c. $4^{\prime \prime}$ x $5\frac{1}{8}$ "
x $2\frac{1}{4}$ ". List \$6.20



4151H341 30
Amp. 3 wire
S/N; 2 Fuses.
120/240 A-c.
 $4^{\prime \prime}$ x $5\frac{1}{8}$ " x $2\frac{1}{4}$ ".
List: \$6.50



CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wis. Division: Airborne Instruments Laboratory. Foreign: Cutler-Hammer International, C. A.
Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.; Intercontinental Electronics Corporation, Inc.

"A reputation for the right answer, fast... brings us more business"

"We specialize in industrial and commercial electrical systems. When a customer in this area has an electrical problem they need solved in a hurry they've come to depend on us for the right answer

fast. The ability to render this service quickly and efficiently has been a cornerstone of our success. A good case in point would be the Biltmore Garage job."

Meet Sidney J. Hill, President and Founder of Hill Electric Company of Los Angeles, California—progressive electrical contractors who have built a reputation for solving customers' problems quickly and efficiently.





Busy entrance to Biltmore Garage, 5th and Grand, Los Angeles.

"Recently the Biltmore Garage decided to install an electrical warning system that would alert both patrons and passersby when cars entered or left the garage. Needless to say they wanted the system quickly. The customer knew what they wanted to accomplish, it was up to us to figure out the best way to accomplish it, sell the idea, then put it in right."



Edwards representative, Eugene Nicholson (seated), L. P. Clark and Hollywood Wholesale Electric's salesman, Dean Kline (center), working-up the sample signaling system.

L. P. Clark, Hill Electric's Sales Engineer, was assigned the task of developing the warning system. "Edwards is the only full line of signaling equipment we handle. It's the most adaptable to the wide variety of situations we find in our industrial and commercial signaling work. Actually, several pieces of equipment would have done an adequate job, but we wanted to come up with the ideal solution. One of the prime difficulties in this job was that the devices had to make enough noise to attract attention against the high background noise of downtown traffic and still not disturb adjacent businesses. Moreover, the Biltmore Hotel is directly across the street and it was imperative that the equipment not disturb guests at night. The next step was to consult with an Edwards distributor, Hollywood Wholesale Electric, and the local Edwards technical representative."

The Edwards Company believes that contractors have an important but sometimes under-rated job to do in the electrical industry. Often we run across men in contracting, like Sidney Hill and L. P. Clark of Hill Electric Company, who are doing their job very well indeed. We're glad to relay their ideas.



Clark demonstrates suggested signaling equipment for Mr. Clay E. Selby (left), Vice-President of the Biltmore Garage.

After looking over L. P. Clark's plan for the system, Kline and Nicholson suggested the equipment that they felt would be the best answer. Clark then mounted the signals on a demonstration board wired up for connection to a power source at the garage. "The best way to clinch this sale was to demonstrate the system under the prevailing conditions and prove its efficiency right on the spot."



"When the system went in, it proved satisfactory in every way. This problem is common to many of the city's downtown garages and I feel that this system has excellent potential for future sales in similar installations. The help we get from the distributor and the local Edwards man in planning a presentation as well as during installation and follow-up proves invaluable in working out the best solution to our customer's problems. It helps us come up with the right equipment fast and it helps us make sure the equipment goes in right and stays in."

L. P. Clark and Clay Selby inspect Edwards industrial chime signal installed at the Biltmore Garage main entrance.

EDWARDS

Specialists in signaling since 1872

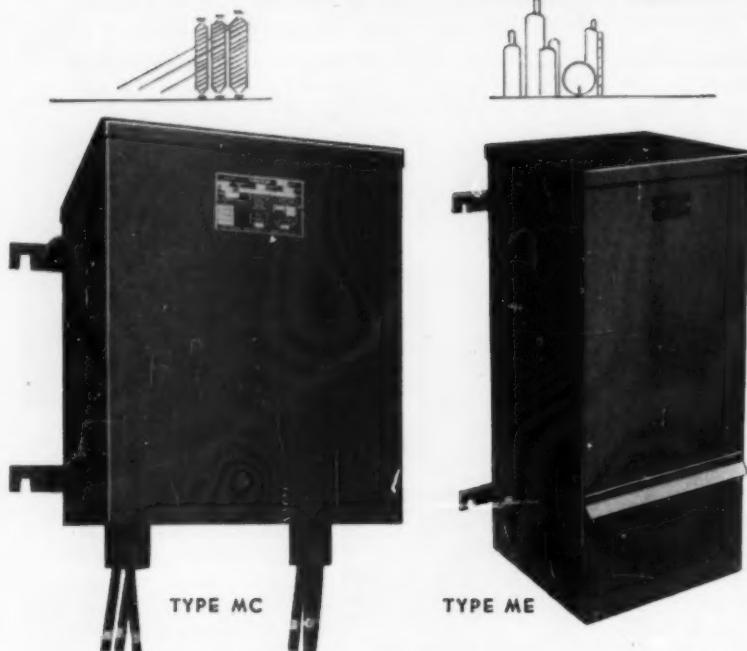
DESIGN • DEVELOPMENT • MANUFACTURE
Edwards Company, Inc., Norwalk, Connecticut
(In Canada: Edwards of Canada, Ltd., Owen Sound, Ontario)

RECOMMENDED FOR SERVICE IN:

Dust-tight
Weatherproof
Corrosion Resistant

Refineries
Bulk Plants
Textile Plants
Chemical Plants
Granaries

LOW VOLTAGE TRANSFORMERS FOR HAZARDOUS LOCATIONS.



Standard Type MC low voltage transformers are designed for use wherever explosion-proof equipment is required. Standard is now specified by most major oil companies and these units are used in hazardous or dust-laden locations. Windings are not exposed to lint, dust and dirt. These air-cooled, dry-type, compound filled transformers are efficient, compact units designed for indoor or outdoor service. Special all-welded steel cases are available. Type MC is designed in sizes through 15 KVA only and ratings through 600 V—single or three phase.

Type ME is designed with Class H insulation in sizes through 150 KVA and ratings through 4800 V—single or three phase. These are completely sealed units but are not compound filled.

Both types are available with terminal chambers or conduit nipples with leads brought out as illustrated.

Ballasts

(31)

New fluorescent lamp ballasts that will operate at less than 90°C without heat radiators in a surface mounted, slotted industrial fixture for two 72- or 96-in. Power Groove, VHO or SHO lamps. Ballasts designated 89G964-65 at 118 volts and comparable units are designed for 208- and 236-volt systems and will operate two F72PG17, two F96P-G17 or corresponding VHO and SHO lamps.

General Electric Co., Schenectady 5, N.Y.

Mounting Bracket

(32)

New pole-band transformer cluster mounting brackets and accessories. Mounts simplify multiple installations of one, two or three single-phase transformers on one pole, and they can accommodate transformers rated three through 167 kva. Cluster mounting brackets are adjustable to pole diameters of 7½ to 12 ins., and they meet EEL-NEMA standards for physical and electrical clearances.

Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.

Terminal Blocks

(33)

Sectional power unit terminal blocks provide high-pressure, solderless connection with heavy current-carrying capacity for machine tool or switchboard termination carefully insulated from each other and ground. Two models are available; P-3, 125 amps; and HP-3, 250 amps. All are supplied with marking strip or are printed to order. Three-circuit models are standard, but additional circuits can be provided on request. Literature is available.

Marathon Special Products Corp., 12th and Cranberry Sts., Erie, Pa.

Junction Boxes

(34)

Newly designed junction boxes are constructed of cast aluminum. Available in three styles—weatherproof, explosion-proof and dust-tight—units can be supplied with hub locations to suit the needs of the customer. Hinged and flush covers are available. Boxes range in sizes from 8- by 8- by 4-in. to 16- by 48- by 10-in., with mounting lugs. They are UL and CSA approved.

Killark Electric Mfg. Co., Vandeventer and Easton, St. Louis 13, Mo.

Standard Transformer CO.
WARREN, OHIO
"WHEREVER THERE IS POWER"



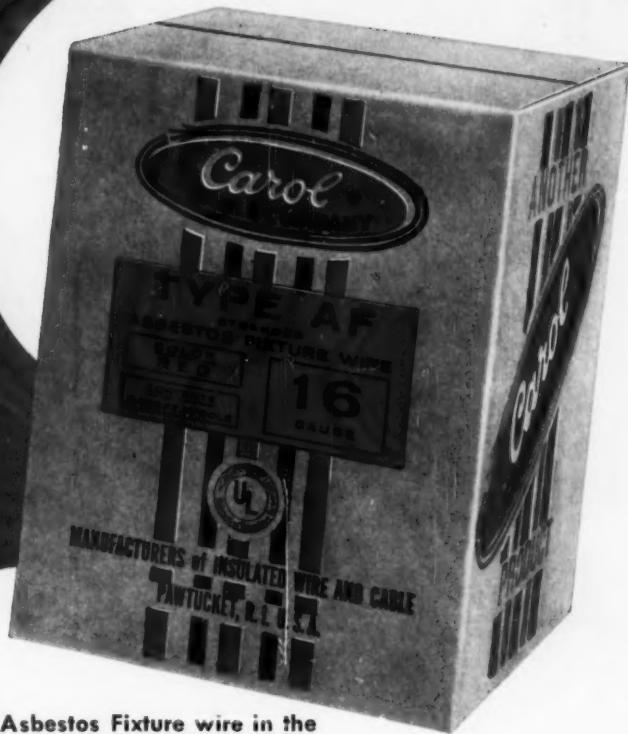
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Here it is . . . a complete line of Asbestos Fixture wire in the same high quality as other well known Carol Cable products.

PRACTICAL PACKAGING • Carol's new distinctive striped carton identifies contents at a glance. Each heavy-duty carton contains the *right* number of spools for the gauge, keeps weight to a practical limit for easier handling.

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AVAILABLE IN 18, 16, 14, 12 and 10 gauge, in black, white, red, green, blue . . . from a network of warehouses across the country.

GAUGE	SPOOLS PER CARTON	APPROX. WT. OF PKG.
18	2	11
16	2	17
14	2	21
12	1	35
10	1	55

*When you call for cable,
call for Carol*



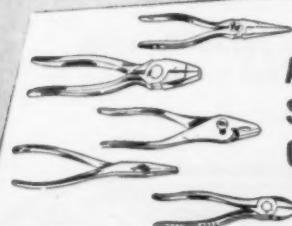
CAROL CABLE COMPANY • Division of the Crescent Co., Inc., Pawtucket, R.I.

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it's the
HANDIEST
PLIER
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ALL

CHAN NEL LOCK
No. 420

• You'll like the all 'round usefulness of the Channellock No. 420 . . . its terrific gripping power . . . its quick, non-slip adjustability up to 1-3/4" size. And you'll find it easy to use in hard-to-get-at places because of its compact design. Mechanics everywhere say no other plier does so many jobs so well. You'll say so, too!

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ASK YOUR TOOL
SUPPLIER FOR
CHANNELLOCK PLIERS

Be sure it's a genuine CHANNELLOCK
Lock for the trademark on the handle

Safety Light

(35)

A flat "light bulb" is an electro-luminescent cell and consists of a phosphor coated on a glass panel which has been treated to conduct electricity. When power is applied, the panel lights. It will be known as the "Rayescent Safety Light". Rated at 1/200 of a watt, the safety light operates on ordinary house current. It measures 2½ by 2½ ins., has two prongs extending from the back and can be inserted into half of any duplex electrical outlet. It fits flush against the outlet.

Westinghouse Electric Corp.,
Bloomfield, N. J.

Conduit

(36)

A new pliable electrical conduit, known as Kopex, can be set, bent and cut by hand. A tube formation, composed of layers of continuous metal, allows protection for cables. It is pressure sealed to prevent the ingress of oil or water. Specially designed adaptors make it easy to join conduit to standard electrical fittings, inspection and junction boxes, etc. It can be produced in continuous lengths, or minimum 100-ft coils in standard electrical sizes from ½ to 1½-in. It is available with P.V.C. outer covering.

Kopex Division of Gemmer Manufacturing Co., 6400 Mt. Elliott Ave., Detroit, Mich.

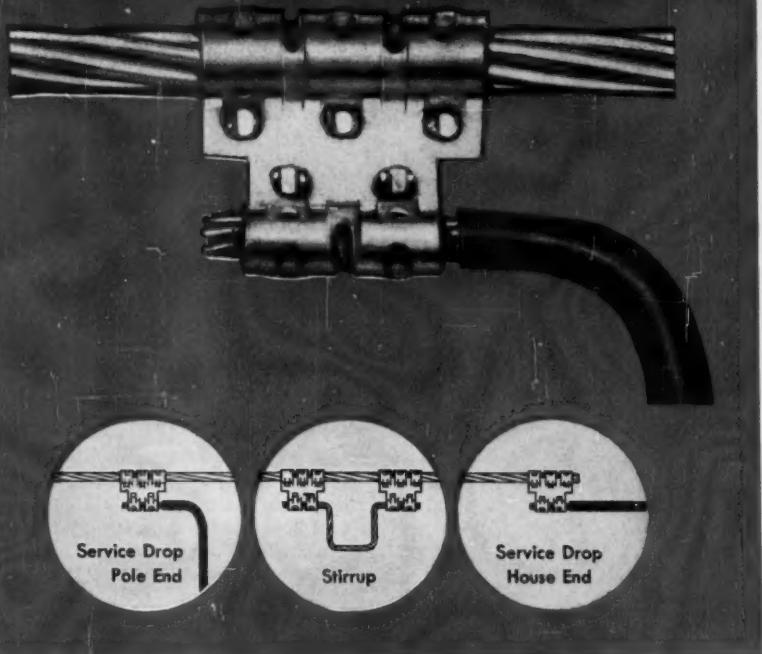
Fire Alarm Systems

(37)

Three new fire alarm systems for schools, hospitals, institutions and industrial plants are now available. One is a master code, closed circuit, supervised type, the second is a non-code, closed circuit, and supervised, while the third is non-code, open circuit, and non-supervised. Master code rings four rounds of a predetermined common code to all sounding devices on the system; a non-code type causes all sounding units to ring continuously. Closed circuit supervised models have a trouble bell included in the system —this rings continuously if there is any break in the circuit until it is repaired. 20 stations may be wired on one circuit. Each has a rated contact capacity of 3 amps at 120 volts ac. They are furnished for either flush or surface mounting. Both closed circuit, supervised systems include an alarm control panel enclosed in a steel cabinet, with hinged door, for wall mounting.

Cincinnati Time Record Co., 1733
Central Ave., Cincinnati 14, Ohio

The TAP that TOPS them all...



THE MULTI-PURPOSE **A-MP UTILI-TAP** for aluminum and/or copper conductors

Tired of all the expensive clutter in your stock rooms—a special tool for this, a special piece of hardware for that? Now you can clear out a lot of your inventory clutter with all new A-MP UTILI-TAP®.

Here is a product that can be used on diverse tapping installations—like no other product on the market. It's permanent, it's sure and it will do many, many jobs.

Your stock can be simplified and easily maintained. Your linesmen can now go up the pole without pockets filled with miscellaneous parts or belts loaded with special tools. Simplify with the A-MP UTILI-TAP®.



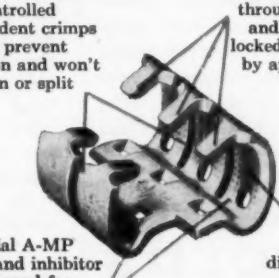
Light-weight matched tooling available in mechanical or hydraulic types.

The only tap on the market that converts from an easily attached open barrel construction to a permanent, closed barrel attachment.

Look at these unbeatable features:

Exclusive split barrel construction for controlled independent crimps that prevent distortion and won't loosen or split

Exclusive locking tabs that are crimped through barrel slots and permanently locked to barrel body by application tool



Special A-MP plating and inhibitor compound for long-life corrosion resistance

Inner barrel dimple serrations to increase tensile strength

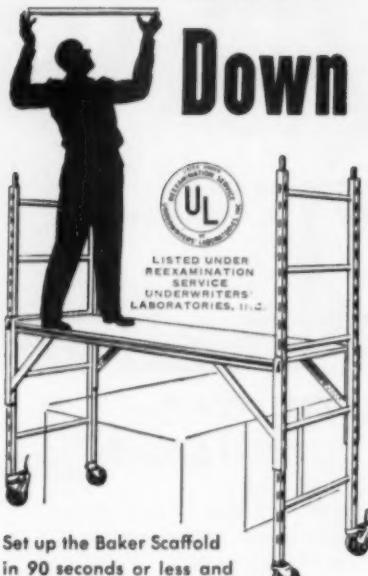
Full range of wire size combinations for aluminum, copper or ACSR conductors.

Send today for more information to solve your tap inventory and reliability problems simultaneously.

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 Exclusive Distributor For **A-MP** Products To The Utility Industry

Getting Up Fast

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Set up the Baker Scaffold in 90 seconds or less and you're ready to move from room to room, over desks and other room equipment which normally presents a problem for scaffolds with cross braces. Its light weight permits one-man portability on your choice of large rubber-tired casters. Combines with companion units to form higher or wider platforms. Locks into rigid position. Has the substantial feel of steel that only steel can give.

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P. O. Box 892, Indianapolis 6, Indiana

Gentlemen: Send the folder described on Baker Scaffolds without obligation.

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Organization _____

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City _____ State _____

DISTRIBUTORS IN PRINCIPAL CITIES

Receptacles

(38)

A new, improved and enlarged line of Hart-Lock duplex receptacles for use whenever electrical equipment should be grounded to assure positive protection. Ground connection may be a permanent shunt, built-in for a metallic grounded system providing a 3-wire locking grounding receptacle, or grounding screws will be supplied for use on non-metallic or multiphase systems. In addition, split circuit receptacles are available for side wiring only—two feeds, one return; or two feeds, two returns. Rated at 10 amps, 250 volts and 15 amps, 125 volts. UL listed.

Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

Power Supply

(39)

A new line of dc power supplies known as the Di-Rect-All. It is available in new wall mounted types and floor models and is supplied in a complete range of both single phase and 3-phase inputs. It can be mounted anywhere that dc current is required. Install unit on a wall or place on the floor and connect ac input and dc output.

Good-All Electric Mfg. Co., Ogallala, Neb.

Master Control

(40)

A motor-driven master control for low voltage remote-control wiring systems turns On or Off as many as 25 relays with a push of a remote-control switch. Relays in turn control up to 25 circuits of lights and outlets. This extends the convenience of the master switch to any number of different locations throughout homes, office buildings, institutions, commercial and industrial buildings. The control has color coded pigtail leads. It fits into a 2-gang plaster ring for mounting on studs or in standard outlet boxes. Where desirable it can also be mounted flush on panels or surface mounted between studs.

General Electric Company, Wiring Device Department, Providence 7, R. I.

Post and Lantern

(41)

All weather, rust-resistant, aluminum lantern is finished in satin black and has frosted glass side panels. It is 13½ ins. high by 8½ ins. wide. Comes complete with light socket. The 3-in. diameter wrought iron post is 78 ins. tall.

International Lighting Mfg. Co., 1825 N. 19th St., St. Louis 7, Mo.

Lighting Fixture

(42)

A new 75-watt "Satel-Lite" recessed eyeball fixture for concentrated, adjustable lighting. Unit consists of a precision-formed 5-in. metal sphere, for use with a 75-watt R-30 lamp, and mounted inside the "T.N.T." Hi-Hat. A swivel and rotating mechanism permits up to 45° vertical tilt, as well as directional adjustment over 360°. R-30 is available in both pre-wired and unwired types, with or without special clip-in louver.

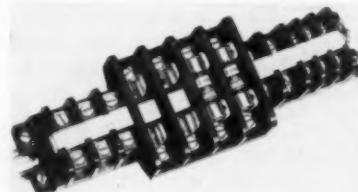
Markstone Manufacturing Co., 1531 North Kingsbury, Chicago 22, Ill.

Ceiling Heater

(43)

A new 1000-watt glass radiant recessed ceiling heater, known as Pyrolite, Model RC. It is easily installed and serviced because finishing frame is spring hinge mounted and readily removable. Units can be mounted separately or in groups of two or more. Units are controlled by wall mounted switch and can be used with or without a separate wall thermostat. Model RC can be wired-in directly with standard R or TW building wire. Motor is two-pole unit bearing type with sealed in lubrication. A thermal safety cutoff automatically disconnects the heating element in case of overheating due to high voltage or motor failure.

Berko Electric Mfg. Corp., 212-40 Jamaica Ave., Queens Village 28, N. Y.



Terminal Block

(44)

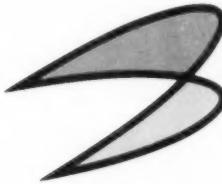
A new fusible terminal block developed for use in applications where fuse protection is required for solenoids and other single- or 3-phase loads. Rated at 30 amps, 600 volts, it will accept any ferrule type fuse 1½-in. diameter by 1½-in. long. Terminal block is made up of individual sectionalized blocks assembled on a mounting channel with a clamp at each end. It can be combined with four different types of terminal blocks for increased flexibility. Bulletin 9080-H is available.

Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.



Curtis Recessed Alzak Aluminum Troffers provide high level general illumination, low-brightness quality, in the American Hardware Mutual Insurance Company building, Minneapolis, Minn. Architects: Thorshov & Cerny. Engineer: Leonard Johnson.

*Curtis Visioneers introduce
new horizons in illumination . . .*


**A touch of
tomorrow
today**



The fast tempo of modern life is characterized by efforts to grasp the future and make it live now. The development and design of advanced lighting equipment to fulfill this goal is a prime Curtis purpose. To serve you better, with products of the future, Curtis is staffed with a group of highly trained and skilled Visioneers (Vision Engineers). These men are constantly looking beyond horizons, adapting new concepts that make for improved lighting. Curtis has over 50 important "firsts" in the science of illumination. Two very significant ones are: (a) development of the concept of lighting from concealed sources, helping end the era of the bare lamp on a drop cord; (b) the pioneering of the Alzak process for permanently finishing aluminum reflectors. If you want lighting today with a touch of tomorrow . . . look to Curtis.

*On the following
pages see how Curtis
Visioneers have given
the modern feel in
lighting to industry . . .*



Reynolds Metals Company, Richmond, Va. Modular design of second and third floors severely tested Curtis ingenuity. To appreciate the enormity of this Curtis Visioneered project—one thousand 10 ft. by 10 ft. grids were used. Architect: Skidmore, Owings & Merrill. Consulting Engineer: Ebasco Services.



Flexibility of the Reynolds offices is obvious. Partitions can be easily moved to expand or decrease the size of various areas, whereas the Curtis wall-to-wall ceiling of light supplies 75 foot candles of maintained illumination. Curtis grid system is mounted 10 ft. 6 in. above floor level, with lamps spaced 16 in. on center. Hexcel Honeylite aluminum diffusers complement the decor.



The look of the future in lighting for Reynolds

To cope with things to come and anticipate the demands of tomorrow, those who mold our nation's products should have a talent that combines ability with versatility. Curtis Visioneers met one of the greatest challenges to their originality and inventiveness in designing a lighting system for the Reynolds Metals Company building in Richmond, Va. Objective was to provide a 100,000 sq. ft. area with illumination that would be permanent yet allow for future changes in the floor plans in keeping with modular concept. Another stipulation was that the installation must coordinate with the air conditioning and sound proofing. Curtis Visioneers solved this multiple problem by forming a completely custom-engineered special aluminum folding grid system . . . a wall-to-wall ceiling of light. No matter how floor arrangements are changed, uniform low brightness will be retained throughout. Through special folding "packages", which permitted 100 sq. ft. of lighting to be installed at one time, an estimated 8,000 man hours were saved, or approximately \$50,000.00.



Vast expanse of office areas can be altered to any size or shape without destroying ceiling pattern or lowering lighting standards. In this special Curtis grid installation, aluminum materials were used throughout. Maintenance advantages are: ease of relamping, ready access to wiring, and simple replacement of the ballasts.

Hallmark Cards, Kansas City, Mo., where Curtis Visioneers "personalized" the illumination system to harmonize with company qualities. Architect & Consulting Engineer: Welton Becket.



Illumination
in the
modern mood . . . for
Hallmark Cards

As the present catches up with the future, buildings must be more than mere places of work for people who breathe life into industry. To capture the feeling of its product, Hallmark Cards adapted the warm spirit of greeting to its new building in Kansas City, Mo. The exterior countenance reflects a buoyant personality one would naturally associate with a greeting card company. The same sparkling atmosphere permeates the office interiors, where all the furnishings have been selected with an eye to comfort and creative inspiration. In keeping with this setting, Curtis Visioneers provided a lighting system which would complete the theme of visual charm and visual well-being. They accomplished this through the use of Curtis Alzak aluminum low-brightness troffers and Curtis Vari-Spot recessed incandescent units. The careful application of these quality products assured glare-free illumination and accentuated the esthetic characteristics of the Hallmark Cards building.



Curtis Vari-Spots produce attractive lighting patterns in various lobbies of the Hallmark Cards building. Reception room shown is approximately 45 ft. by 45 ft. Vari-Spots are used here to accent two areas. Each is effectively dramatized.



The handsome Mutual Savings & Loan Association Building, Ft. Worth, Texas. Architect: Preston M. Geren. Consulting Engineer: Yandell, Cowan & Love Engineering Co.

Visioneering with foresight in Texas

Progress and foresight are personified in one of the newest architectural adornments gracing the Fort Worth, Texas, skyline . . . the Mutual Savings and Loan Association building. Up-to-the-minute in every respect, the structure contains dramatic areas of low-ceiling design. However, they created a problem in the selection of overhead lighting. The question was: How to achieve high levels of illumination without objectionable shadows or glare? Because of the precise details involved in the banking profession, visual acuity at all times is a major consideration. Curtis Visioneers were consulted. They offered this solution: Using standard products, with only slight modifications to suit the particular situation, Curtis Visioneers produced a Strato-Lux continuous luminous ceiling system, completely integrated with the low-ceiling design. High levels of illumination were provided and even diffusion of light was assured. Personnel and patrons alike enjoy the convenience and eye-pleasing ease of low brightness quality.



Curtis Strato-Lux provides high levels of glare-free illumination to promote efficiency and serenity. Even with Strato-Lux directly overhead, there are no bright spots, no reflections, in critical viewing areas. Exceptionally low ceiling brightness is achieved through use of #6025 Holophane acrylic plastic Controls.

Many solutions to a variety of lighting problems are offered in the AIA award winning book, "Modern Lighting by Curtis". Write for your copy today.



CURTIS

Visioneers in Planned Lighting®

Curtis Lighting, Inc., 6135 W. 65th St., Chicago 38, Ill.
In Canada: 195 Wicksteed Ave., Toronto 17, Canada.

Catalogs & Bulletins

(45) DISTRIBUTION TRANSFORMERS. Bulletin S-401-C gives complete data on two new lines: Type WA, the conventional unit, and Type SWA, the unit designed specifically to reduce copper losses, plus data on calculating annual operating costs. Standard Transformer Co.

(46) SWITCH ENGINEERING DATA includes detailed information for snap action switch use in cam applications. Cherry Electrical Products Corp.

(47) HIGH SPEED GENERATORS. Bulletin 2100-PRD-250 describes line of generators rated 3.75 through 62.5 kva, 60 or 50 cycle, single or 3-phase, in all standard voltages below 600 volts. Electric Machinery Mfg. Co.

(48) INDUSTRIAL LIGHTING. 12-page catalog No. 66 contains line of industrial lighting fixtures and accessories, with illustrations, exact dimensions and details. Adjustable Fixture Co.

(49) CONDUCTOR SYSTEMS. 8-page catalog No. 5-58 describes Hevi-Bar 1000-amp conductor systems of mobile electrification for heavy duty applications. Included are illustrations and descriptions of conductors, collectors, and accessories. Insul-8 Corp.

(50) RUBBER HEATERS. Bulletin C-102 describes flexible silicone rubber heaters which are waterproof, very thin, available in any plane shape, and adaptable to almost any area where heat up to 400F is needed. Watlow Electric Mfg. Co.

(51) TONG TEST AMMETER. 8-page catalog illustrates eight types of instruments, giving detailed information on selection, ordering, and use for both ac and dc measurements. Columbia Electric Mfg. Co.

(52) CLOCK SYSTEMS. Technical Topic No. 1 covers reliability, accuracy, self-correction feature, installation and design of dc impulse clock systems. Cincinnati Time Recorder Co.

(53) CONNECTORS for batteries and general power use are described in new catalog GB-7-2958, 20 pages. Cannon Electric Co.

(54) TROLLEY BUSWAY electrification system bulletin No. 60 covers new 20-amp trolleys, enlarged line of standardized curved track sections and other new items used for cranes, hoists, moving test lines, portable and machine tools, etc. Feedrail Corp.

NEW WIRING DEVICES FROM Rodale

Touchette®

422



First and still the best. Only patented single-button touch-action switch on the market. Measures just 1" in depth for fast, simple installation. UL listed, CSA approved.

U.S. Pat. No. 2,820,113

COMBINATION DEVICES

470



Single pole switch and "T" slot receptacle independent of each other on same circuit, or receptacle can be controlled by switch. UL listed.

GROUNDED CUBE TAP



482

A Rodale exclusive. The economical way to convert a single grounded receptacle to an approved grounded 3-way outlet. UL listed, CSA approved. Patent applied for

HEAVY DUTY GROUNDED CAP AND CONNECTOR

798



Connector:
U.S. Pat.
No. 2,795,767

Heavy duty all-rubber connector body has patented concealed slot reinforcements to prevent incorrect blade insertion. Cap interchangeable with other 3-wire parallel grounded devices. UL listed, CSA approved.

NIGHT LIGHTS

990



Slumber-Glo
Plug-in
Night Light

The night light as close as the nearest receptacle. Now in rose, blue, ivory, brown. Vertical mounting: a Rodale exclusive. UL listed.

993



Safety-Glo

Practical, easy-to-operate safety light. With or without switch. Ideal for residences, hospitals, theaters, hotels, commercial buildings. UL listed.

Designed To Make Installations Easier ... Save You On-The-Job Time

THE "FORWARD-LOOKING" APPROACH: that's what we call the new Rodale wiring devices. Some, like the Grounded Cube Tap, are Rodale "exclusives". Some, like Touchette, were the first of their kind on the market. All have been designed, tested, re-tested and perfected to save time ... make installations easier.

A COMPLETE LINE FOR JUST ABOUT ANY JOB, all scaled low in price to give you a better profit picture. For further information and literature on the new Rodale wiring devices or the complete line, why not write Rodale today?

warehouses in Chicago and Los Angeles - representatives in all principal cities

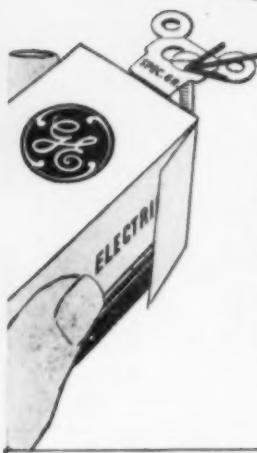
sold exclusively through Electrical Wholesalers



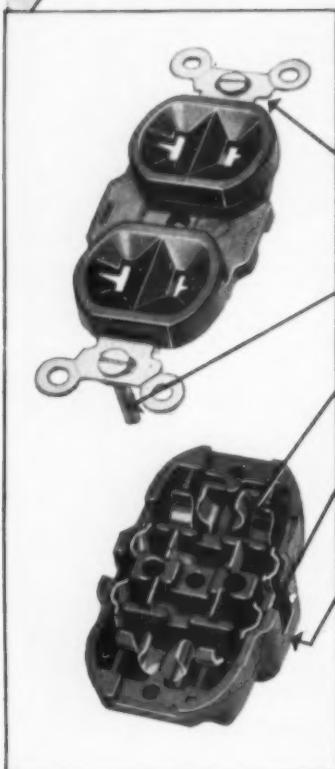
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manufacturing co., inc.
dept. cm-12, Emmaus, Pa.

SPEC. GR.



This symbol on
Specification Grade
G-E Wiring Devices
assures you of extra features
for handy installation and
long, satisfactory service



The GE4029 de luxe grade outlet with pressure-lock terminals is typical of the extra-high quality you get in all G-E Specification Grade Wiring Devices

- Plated mounting strap passing through device is clamped firmly between face and base. Won't bend out of position during wiring.
- Plaster-cleaning screws are held in strap by fiber washers . . . all ready for mounting.
- T-slots, with double-wipe contacts, in rugged, two-piece molded plastic housing . . . assure dependable service.
- Break-off links between terminals can be easily removed with screwdriver, making outlet convertible to separate feed or separate ground if desired.
- Pressure-lock terminals lock stripped portion of each wire inside device, for positive, neat, totally-enclosed connection. Each terminal accepts one No. 10 Awg or two Nos. 14 or 12 Awg wires. Three outgoing feeders can be inserted for extension to other outlets, lamp-holders, etc.
- 15A, 125V rating. Available in brown, ivory. Listed by U.L., meets Federal and REA specifications.

Choose from the line of General Electric Specification Grade Wiring Devices for easier, more profitable, more dependable wiring installations. These high-quality devices contribute to the best reputations of the men who recommend or use them. General Electric Company, Wiring Device Department, Providence 7, Rhode Island.

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

(55) **METAL FRAMING SYSTEM.** New and expanded general engineering parts catalog, 180 pages, illustrates and lists 1400 fittings, channel members, and other parts, with section on typical applications. Unistrut Products Co.

(56) **RADIANT HEATERS** for controlled area heating, indoors or outdoors, rated 115 or 230 volts, from 1000 to 4000 watts. Quartz Products Corp.

(57) **DISTRIBUTION CENTERS.** 4-page bulletin 12004A gives condensed information on expanded line of Tranfo units, pre-engineered packaged load distribution centers suitable for such applications as supermarkets, shopping centers, industrial plants, hotels, schools, churches and office buildings. I-T-E Circuit Breaker Co.

(58) **SATURABLE REACTORS** for regulating and controlling electric power for manufacturing processes. Units are rated from 1 kva to 3000 kva, single and three phase. Sorgel Electric Co.

(59) **AC CRANE CONTROL.** Bulletin 6431 describes components, enclosures and applications of Type VL crane control for light industrial ac cab or floor-operated cranes. Electric Controller & Mfg. Co.

(60) **MAGNETIC AMPLIFIERS**—their construction, operation and use. 36-page bulletin 1105-1 is a basic text with performance curves, schematic diagrams and cutaway drawings. Vickers Inc.

(61) **FANS**, low- and high-pressure. 4-page bulletin 8914 describes expanded line of Model IC Ventura fans with installation type drawings and dimensional data. American-Standard.

(62) **FLUORESCENT TROFFER.** New catalog sheets describe Slendex shallow troffer and surface-mounted units; 4-page folder shows applications. Included are lighting characteristics, mounting details, and coefficients of utilization. Smithcraft Lighting.

(63) **ELECTRIC HEAT** — "From Lobby to Loading Dock". New booklet on factory heating illustrates practically every problem likely to be encountered and shows modern equipment answer for each one. Edwin L. Wiegand Co.

(64) **OIL IMMersed TRANSFORMERS.** Instruction Sheet 410 covers installation, ratings, storage, oil, gaskets, maintenance, replacement parts, shipping and handling of pole-type transformers from 3 to 167 kva, single phase, and 9 to 150 kva, 3-phase, 15 kv or less. Precision Transformer Corp.

Question:

Why did Greater Cincinnati Airport use S & C Metalclad Switchgear in its high-voltage power system?

Answer:

There was *only one answer* to the requirements of maximum reliability, continuity of service, adequate short circuit protection, and full load switching, all at low cost—S & C Fused Load Interrupter Metalclad Switchgear.

Q:

Why can S & C offer savings up to 50% in this modern switchgear and still meet the highest standards of quality?

A: Because of the inherent simplicity of the S & C Fused Load Interrupter (compared to complex circuit breaker equipment), savings of 50% and more in the initial cost of switchgear equipment can be realized while the highest quality standards are maintained for the installation.

Q:

How can you get information about such switchgear?

A:

From S & C sales offices in principal cities. Consult your telephone directory.

S & C ELECTRIC COMPANY
4433 Ravenswood Ave., Chicago 40, Ill.

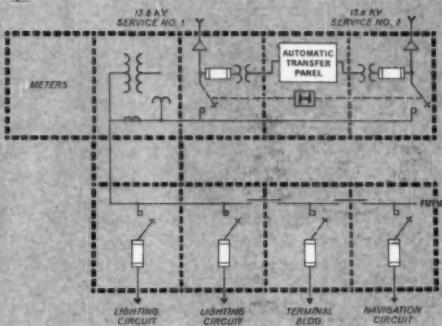


Specialists in High-Voltage Circuit Interruption for Electric Utilities Since 1910



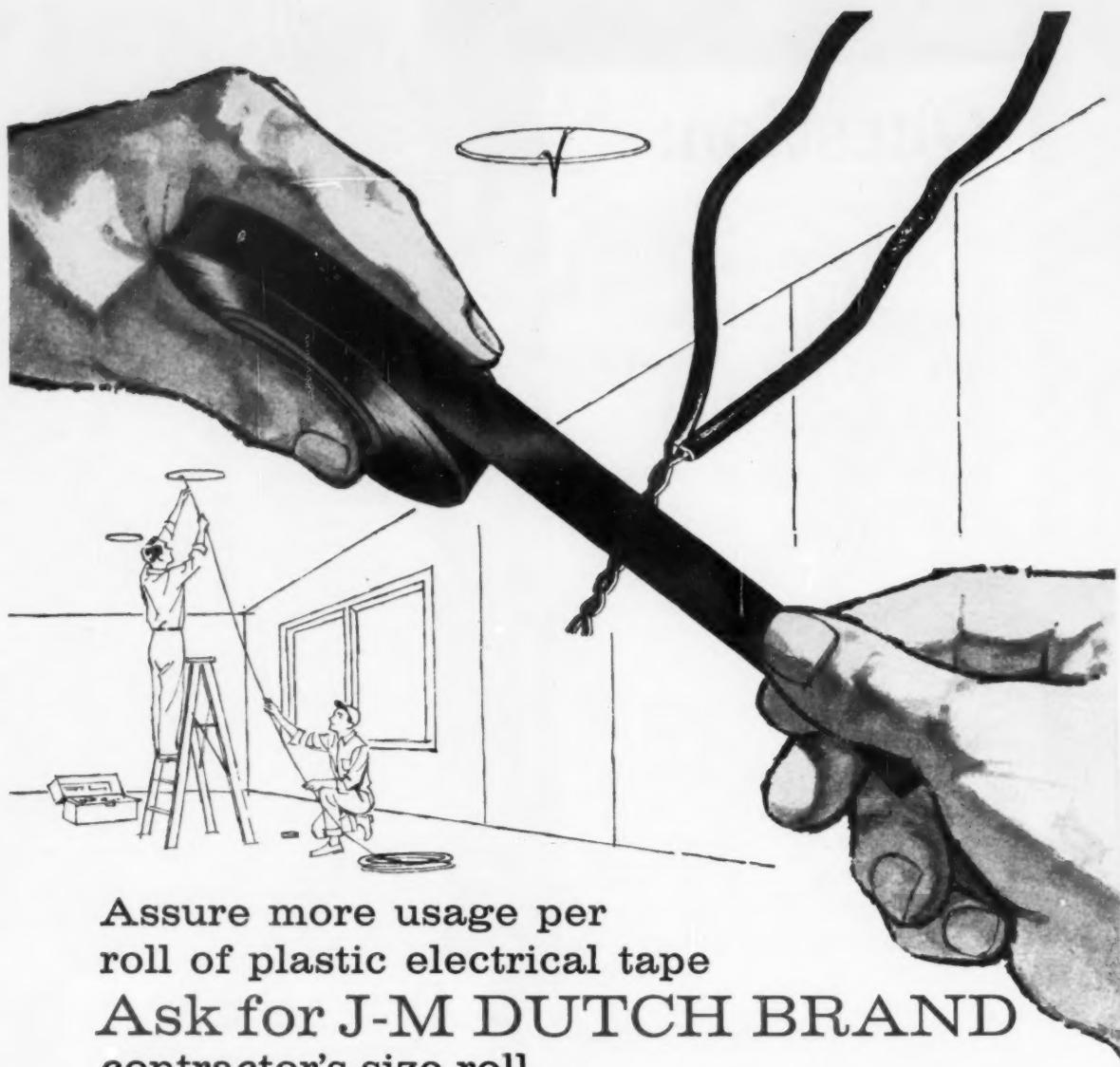
Q: Why are power fuses and load interrupters used to replace circuit breakers in this type of switchgear?

A: Because conductors in such installations as this modern airport run in protected underground conduit and tunnels, and are not subject to transient faults caused by trees, wind, or rodents; protection against permanent faults is the only kind needed—and this is provided by S & C Power Fuses.



Q: How is automatic preferred-to-emergency transfer for service continuity provided in this S & C Metalclad Switchgear equipment?

A: By means of an S & C Standard Automatic Transfer Panel used with Moto-Draulic operator, a variety of throwover schemes is available at the flip of a switch. This transfer panel provides for making either source preferred; choice of automatic or manual return; choice of time delay (up to 10 minutes); and optional manual operation of line switches.



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Reader's Quiz

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Testing Metal

QUESTION Y34—The materials department of my company has received some new metal and wishes to determine the effect of expansion and contraction of same.

I have been given the job of designing means to automatically accomplish the following: The metal is to be suspended in several hundred degrees heat for three minutes and then lowered into a vat containing a cold solution for approximately one minute and then returned to the heat area for three minutes.

This operation is to continue automatically for 12 hours a day, a complete cycle to take place in approximately four minutes.

My first thought visualizes a motor, means to reverse direction of same, and means to stop the motor at a predetermined point at each end of the cycle.

The heat chamber is directly above the cold chamber and separated by a distance of approximately 4 ft. The metal could be lifted and lowered by a chain perpendicularly. Design of the heating and cooling chambers does not enter into this problem. Will be pleased to receive some suggestions.—B.A.S.

ANSWER TO Y34—This could be accomplished by use of a time switch that could be set to control the time the material is in the heat area. The switch controlling an ordinary power hoist could raise material to pre-determined point where stop switch could stop hoist, and also make contact for locomotion which could be arranged by using cables to a power winch. When directly above cooking vat another stop switch stops cable winch and starts hoist in down motion into cooking tank. The stop for this motion can be arranged on the chain hoist.

The time switch contacts will have to be set so that it will allow the time for change plus the minute for cooking before it closes the upward motion on the hoist. These stop and start stations can be placed so they will mechanically operate in succession when called on to do so, although the time

switch will regulate the time that the material is in the heat and also in the cooking vat. Reversing magnetic switches must be used on chain hoist and also on cable winch motors—E.H.

ANSWER TO Y34—The metal sample will have to be very thin and straight, otherwise the metal will get a 10 or 25 degree temperature change in this short time. You will have to circulate the cooling liquid. You can heat the sample with low voltage electricity a few inches above the cooling chamber or you can make the sample into a tube and feed hot and cold gases or liquids through the pipe—H.S.

ANSWER TO Y34—One simple solution to your problem is to utilize a bicycle chain, two sprockets, a limit switch, a cam timer and a gear-head motor. The test-metal sample is so fixed to the chain that it is perpendicular to the chain. At the upper position it extends into the hot chamber and at the lower position into the cold chamber. The timer energizes the motor circuit and the limit switch de-energizes the circuit and properly positions the test metal sample.—J.M.

Pilot Lamps

QUESTION Z34—In our plant we use 6-8-volt pilot lamps on our 220-volt control circuits. Voltage to the lamps is stepped down by one of three means, viz., 1) a resistor in series with the lamp; 2) a capacitor in series with the lamp; 3) a 220/6-volt transformer.

I would appreciate getting opinions from some of your experienced readers as to the relative merits of each scheme.—R.E.B.

ANSWER TO Z34—Assume the lamp is rated at 6 watts, 6 volts. The lamp will draw 1 amp no matter which of the three systems under discussion is used.

In using a series resistor to provide sufficient voltage drop for proper lamp operation, the resistor would have to have an ohmic value of: $R = 220V - 6V/1A = 214$ ohms and be capable of dissipating: $P = I^2R = (1)^2 \cdot 214 = 214$ Watts.

A resistor of this type would cost about \$7.00 but the cost of power dissipated would be about 0.5 cent per hour of operation, assuming the average cost of energy at about 2 cents per kilowatt-hour.

If a capacitor is used, it would have to meet the following requirements: $C = 12$ microfarads, vars = 220.

A suitable capacitor would cost about \$4.00 but its cost of operation would be negligible. However, to get proper operation of the lamp, the capacitor would have to be adjustable around the 12 microfarad value and this would prove to be impractical.

A transformer for this use would require a 220V/6V transformation ratio. A suitable transformer with proper volt-ampere rating would cost about \$7.00 and one transformer would be required for each lamp in the system.

The utilization of a resistor for dropping the line voltage would be very impractical because of (1) cost, (2) size, (3) power lost and heat produced in the resistors. The capacitor would be a poor solution because of the requirement that it be adjustable around the 12 microfarad value. The transformer would be a good solution in that it would overcome all the deficiencies mentioned. If a pair of control contacts is available near the lamp location, one transformer could be used with a rating of 6 volt-amperes for each lamp. The lamp and contacts would be placed in series on the secondary side of the transformer.

Probably the most suitable solution would be to use neon or other gaseous lamps with a small current limiting resistor in series. These are available in a wide assortment of types and sizes and are relatively low in cost.—I.F.

ANSWER TO Z34—One can appraise the three alternatives on the basis of first cost, and of the running costs resulting from energy consumption. A resistor is the least expensive solution in first cost but the most expensive regarding continuous power drain. It dissipates 220-8/8 times the power of the lamp. If the lamp uses 1 watt the resistor uses 26.5 watts. A trans-

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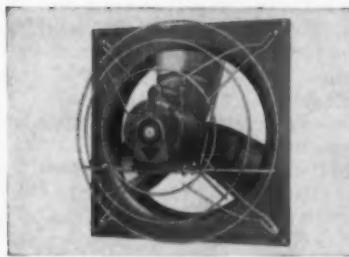
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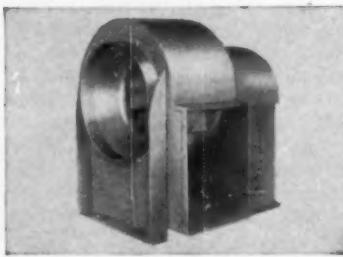
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former is considerably more expensive in first cost than a resistor but it dissipates only its losses (iron and copper losses). They will be in the order of a watt or a few watts, at most.

A capacitor of say one microfarad and rated for operation of 220 volts will cost more, or maybe just as much, as the resistor but less than the transformer. Its power consumption will be negligible. It has to dissipate its dielectric losses which are smaller than the iron and copper losses of the transformer, and way smaller than the losses of the resistor.

I would consider the capacitor as a first choice.—I.F.R.

Electric Stoves

QUESTION A35—It would be greatly appreciated if you could provide me with a circuit which shows how you can get seven heats and an off position for an electric stove having two elements per plate and operating on a single phase, 3-wire, 120/240-volt circuit.

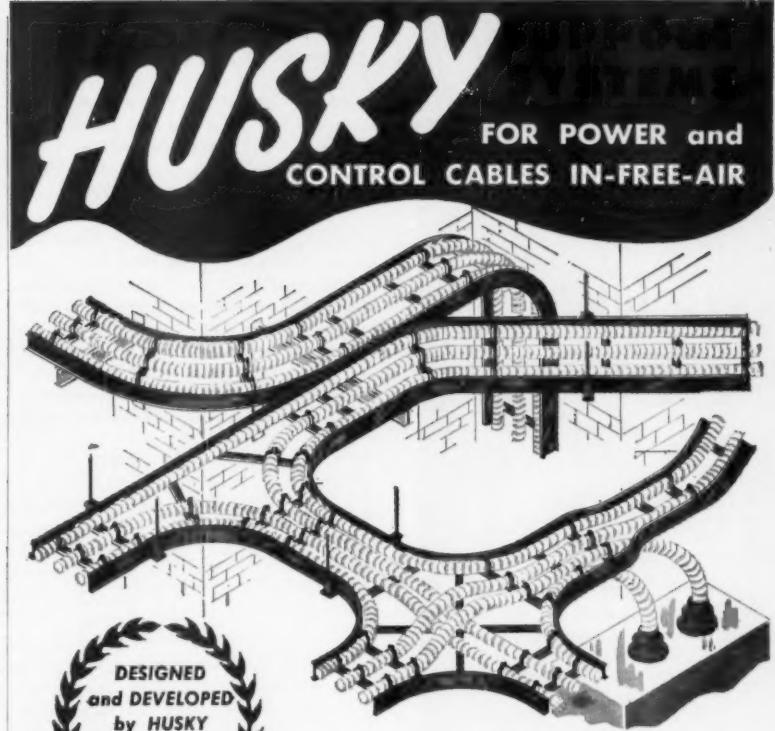
We do have a great number of these stoves in Canada, but it seems almost impossible to obtain information as to their operation.—J.S.B.

ANSWER TO A35—J.S.B. did not detail the make or type of switch used on the stoves he is concerned about. I admit that in my travels in our great friendly neighbor country of Canada I did not examine the kitchen stoves of the citizens. Nonetheless as a clue I offer J.S.B. the following idea:

Assume each plate on the stove to have two elements of different wattage and rated for 240 volts. Say they are 500 and 1000 watts each. Then on 240 volts we would get these heats:

33½ watts with 500 + 1000 watt elements in series, $\frac{1}{2}$ of the heat coming from the higher resistance 500 watts. 500 watts alone on 240 volts, 1000 watts alone on 240 volts, 1500 watts with 500 + 1000 watt elements in parallel. When the switch applies 120 volts to the elements above, which were made for 240 volts, from $W = E^2/R$, R being fixed (except change due to temperature) if E is $\frac{1}{2}$ as great, watts = $\frac{1}{4}$ of values given above, so we would get:

- 83½)
- 125) watts to correspond to
- 250) hookups given above.
- 375)



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DESCRIPTION: Continuous expanded metal or solid bottoms set on cross yokes. Furnished in several depths. Lengths up to 16 feet.

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USE: Support of individual power and/or several control cables.

DESCRIPTION: One piece construction. Lengths up to 16 feet.

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USE: Support of multiple control cables where continuous bottom is NOT required.

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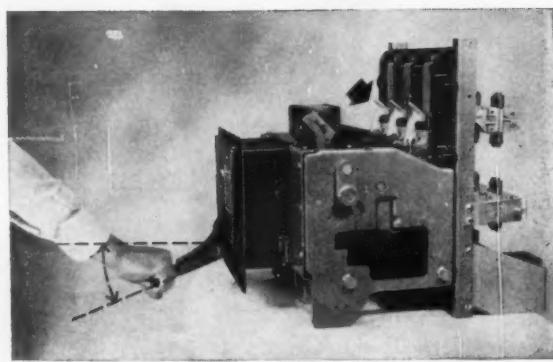
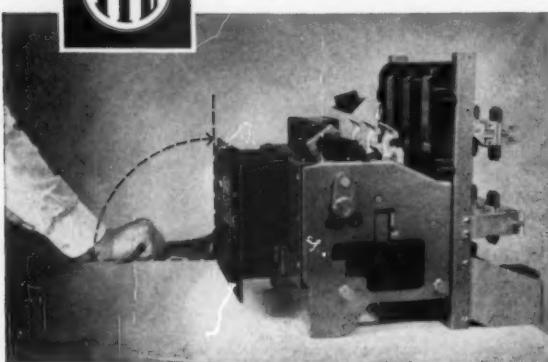


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Only I-T-E has manual quick-make operation available in 225 through 1600 amp rating

Only handle moves. Contacts are static during first 90% of pulldown handle travel. In this picture, arc chutes are removed.

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Only I-T-E has doors closed in all positions while racking

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In test position. Power contacts disconnected —control contacts connected.

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the simple drawout mechanism fits into the escutcheon through a lift shutter. The shutter cannot be lifted while the breaker is closed. The breaker cannot be closed while the shutter is lifted. This means more than greater safety—you can forget the dirt problem; the nuisance of open doors impeding aisle travel; the risk of circuit breaker damage from exposure, even when completely out of service.

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I-T-E CIRCUIT BREAKER COMPANY
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Questions on the Code

Answered by:

B. A. McDONALD, New York Board of Fire Underwriters, Rochester, N. Y.
B. Z. SEGALL, Consulting Electrical Engineer, New Orleans, La.

Common Neutral—Branch Circuit

Q. Does the code permit common neutrals in branch circuits? I have seen as many as eight 120-volt circuits with a single common neutral in home runs to a lighting panelboard. The lighting served was all incandescent. I have always believed that common neutrals are only permissible as feeders. Can you help me in this regard. I can see the advantage of the common neutral in home runs, i.e. reduced voltage drop, more economical initially etc. What are the disadvantages, if any? If allowed, what are the conditions necessary? —G.A.D.

A. The provisions of Section 7312 recognizes the use of a neutral conductor common to eight ungrounded branch circuit conductors for outside wiring on a single pole or structure as outlined.

Section 2204 also recognizes a neutral common to more than one feeder as covered by this section. Prior to the 1940 edition of the code, the use of a neutral common to more than one branch circuit was recognized, in varying degrees, by the code for several years. Section 2113 of the 1937 Code read as follows:

"2113 Common Neutral. A common grounded neutral conductor may be employed for two or more branch circuits provided not more than eight ungrounded conductors are used. Such a common neutral conductor shall have a carrying capacity at least sufficient for the current of the maximum unbalanced load. The same number of circuits shall, as nearly as possible, be connected between the neutral conductor and each of the other conductors of the system. If the circuit conductors are installed in conduit or other metal enclosure, all conductors of the group shall be installed in the same conduit or enclosure."

This provision was deleted in the 1940 Code. As a result such procedure is no longer recognized except as provided in Section 7312. As I recall, the deletion was influenced by several factors which

indicated the procedure to be impracticable especially when cable systems of wiring were involved. In the case of metal conduit the various combinations of branch circuit conductors with a common neutral could be readily satisfied, but any advantage obtained would be offset by the reduced current-carrying capacity of the branch circuit conductors. A No. 12 copper conductor in a conduit containing seven to nine conductors would only have a current-carrying capacity of 14 amps. (Note 4, Table No. 1). Previous to the 1940 Code, such derating factors were not involved, and there could have been some advantage in having a neutral common to several branch circuits for home runs. Other factors concerned the size of outlet boxes, and the reduction in the size of the neutral conductor as the loads served continued to diminish.

If the installations you have seen were installed since 1940, there is, in my opinion, a code violation. If they were installed previous to 1940, no code violation is involved. I mention this point since I recall several years ago a critical observation by a contractor who thought I was giving a competitor a break by permitting him to use a neutral conductor common to several branch circuits in violation of code rules. The records definitely showed that the installation was made prior to 1940 and there was no code violation.—B.A.McD.—12/1/58

Non Code Wires

Q. The NEC recognizes only certain types of wire and cable; e.g., TW, T, R, RH. Yet there are many types of wires and cables that are superior to these code wires and cables. Is the use of these other cables prohibited by the NEC? Note: it appears that they are prohibited since NEC requires code marking.—M.J.G.

A. A strict application of the code requirements would eliminate the use of any wires or cables that are not recognized by the code. However, through the application of the generally accepted

principle (and its specific definition in the code) that approval is the acceptance by the authority enforcing the code, there are many other types of wires and cables being permitted for specific and special installations.

The code recognizes installations above 600 volts specifically in many sections (for services, motors, etc.) and has one article, No. 710, that states the general requirements for such installations. Yet it does not set up any standards nor recognition for wires and cables much above 5000 volts.

This seeming discrepancy has been recognized by the Code Making Panels and it is believed that some specific recognition will have to be made in the code for higher voltage wires and cables. For example, 15-kv cables are quite common now in both industrial and commercial occupancies. Many fine cables are available for such installations but none have code recognition as such.

Where the problem arises, it is usually a rather simple matter to obtain permission from the local inspection authority to use these cables. The reputable and established manufacturers of these conductors fully guarantee their products and have evidence of very fine records of performance to back up this guarantee.

There are some highly specialized wires and cables made which are superior for some applications to those recognized by the NEC. They can in many cases be used for general wiring installations. Here again if the premium quality is warranted it is usually an easy matter to have them approved by the local inspection authority. Many of these higher quality wires and cables, however, have in the past few years been submitted for code recognition and do show the approved code marking for their particular class and usage.—B.Z.S.—12/2/58

Nylon-Jacketed Type TW Wire

Q. Kindly render your opinion regarding the type of wire to be used for a feeder to a gasoline

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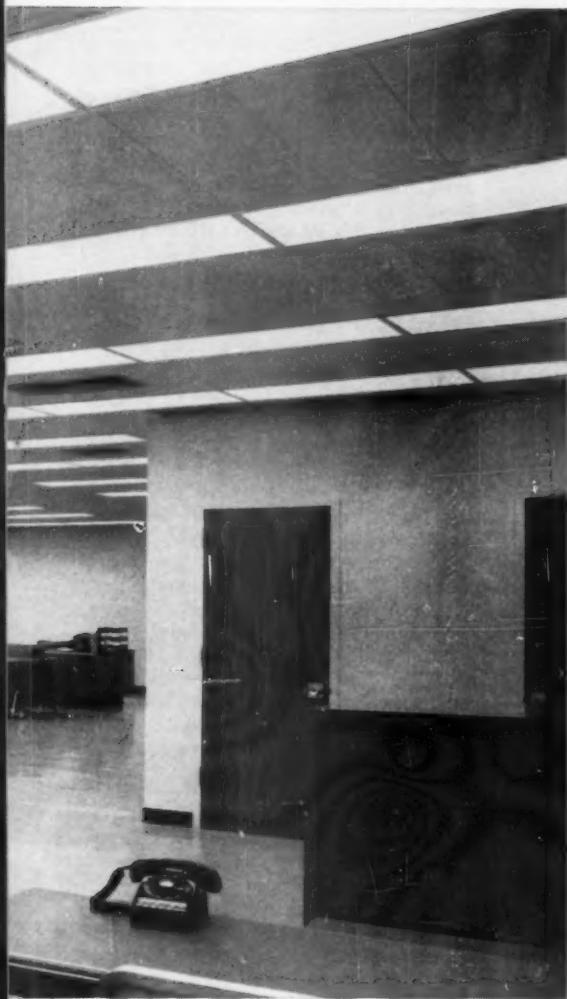
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station on opposite side of road from building where service is installed.

This feeder, 120/240 volts, was laid out by an engineer, and he has specified three No. 00 in 2-in. conduit to be type RHW neoprene jacketed wire. Since this conduit runs underneath the road in an 18-in. tile pipe that also contains three 2-in. pipe lines filled with different grades of gasoline, I think that the electrical conduit should be classified as being in the gasoline or hazardous area and therefore should have either lead covered or nylon-jacketed insulation. The engineer has seen fit to specify EYS sealing fittings so I think he should have included special gasoline resisting wire in place of RHW.

Kindly give me your opinion on this matter.—C.M.A.

A. Section 5023 of the N. E. Code reads as follows:

"Conductor Insulation Class 1, Divisions 1 and 2. Where condensed vapors or liquids may collect on or come in contact with the insulation on conductors, such insulation shall be of a type approved for use under such conditions or the insulation shall be protected by a sheath of lead or by other approved means."

Section 5120-c calls our attention to this code provision and implies that gasoline dispensing and service stations are hazardous locations where Section 5023 applies.

In the case under question, where both gasoline lines and electrical conduits are installed in a common tile duct, it is my opinion that such conduits are in a Class 1, Division 1, location, and it appears that the engineer has a similar opinion. As a result, nylon-jacketed Type TW conductors, or lead covered conductors should be used in such conduits. Reference to the Electrical Construction Materials List published by the Underwriters Laboratories indicates that nylon-jacketed Type TW wire is only labelled in sizes No. 14-6 AWG. As a result full compliance with the code would require the use of lead covered conductors. The inspector however has the responsibility of deciding on the term "approved" as used in Section 5023. (See definition of "Approved.") When decisions of this nature are made with no background of authority, such as the Underwriters Laboratories, he assumes a responsibility which may be difficult to justify in the case of controversy arising when a fault occurs. A neoprene jacketed Type RHW conductor is not, to my knowledge, approved by U.L. to be

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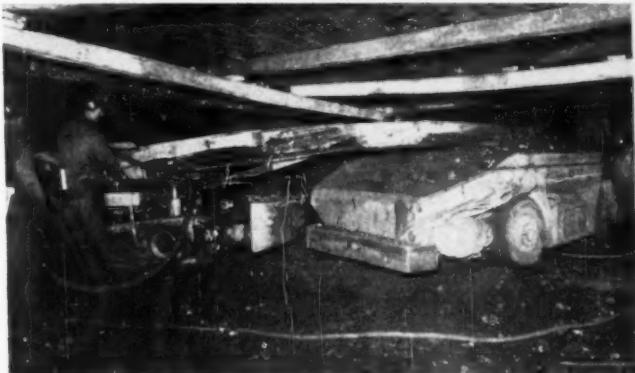
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City _____ Zone _____ State _____

used where exposed to gasoline or gasoline vapors, and in the absence of such approval I would hesitate to accept such a type of insulation as satisfying the provisions of Section 5023.—B.A.McD.—12/3/58

The only distinction between the two wordings concerns the recognition of transformers and the deletion of any reference to the branch circuit overcurrent device. A literal reading of the present rule indicates to me that the inspector is correct when he limits the branch circuit serving such loads to 15 amps in size. This opinion is confirmed by Abbott's N. E. Code Handbook by the following comment:

"No limit is placed on the number of outlets that may be wired on one circuit on a sign or for outline lighting. The total load on any one circuit at 115 volts must not exceed 1725 watts. If incandescent lamps are used, the number of outlets per circuit depends upon the size of lamps to be used".

It is significant to note however, at the time the original rule was formulated in 1923, that the code only permitted 12 outlets on a circuit, and medium-duty lampholders had to be protected by overcurrent devices rated at 15 amps or less. Since incandescent signs and outline lighting at that time usually involved the use of 25- or 40-watt lamps, the code recognized the fact that the limitation of 12-40 watt lamps on a 15-amp branch circuit, with a total load of 480 watts, was inconsistent. As a result, the above exception, which permitted any number of outlets on the branch circuit, was formulated.

With the advent of the general purpose 20-amp branch circuit, which first appeared in the 1951 Code, I am unable to visualize any occasion for the present 15-amp limitation of Section 6006. The code no longer limits the load on a branch circuit in terms of outlets. We have for some time been speaking in terms of amperes. We now recognize all types of lampholders on a 20-amp branch circuit, provided the circuit is wired with No. 12 conductors. Ordinary fluorescent fixtures may be connected to 20-amp branch circuits. Section 2125-b which limits the circuit loading to 80%, when loads continue for long periods of time, also enters the picture.

In view of the foregoing, I believe that the present provisions of Section 6006 should be revised so that signs and outline lighting, wired with No. 12 conductors, could be served by a 20-amp branch circuit. If the 80% derating factor is applied the 20-amp circuit would be limited to a load of 16 amps which closely approaches the 15-amp limitation now existing.—B.A.McD.—12/5/58

Mercury Tumbler Switch

Q. In your opinion will a hermetically sealed mercury tumbler wall switch be acceptable for Class 1, Div. 2 locations, installed in a metal switch box?—D.C.

A. Section 5016b1 states the requirements and in phrase (1) permits general purpose enclosures if "the interruption of current occurs within a chamber hermetically sealed against the entrance of gases and vapors".

These mercury tumbler switches are hermetically sealed and would therefore come within this requirement. I would believe them to be acceptable for Class 1, Div. 2 locations in a standard switch box.—B.Z.S.—12/4/58

Signs on 15-amp Circuits

Q. Article 600 (Section 6006) states that the number of sign or outline lighting outlets, lamps, and transformers connected to a branch circuit shall not place more than 15 amps on that circuit. In your opinion, is an inspector justified in requiring that the overcurrent devices in sign or outline lighting branch circuits have a maximum capacity of 15 amps? This, in effect, limits the load on this type of circuit to 10 or 12 amps.—E.E.

A. The present provisions of Section 6006 first appeared in the 1923 edition of the code, slightly altered as follows:

"Section 3804-g. Circuits shall be so arranged that the number of outlets and the lamps connected to them shall in no case be such as to place more than 15 amps on the branch circuit fuse".

The present provisions of Section 6006 first appeared, exactly as now covered, in the 1937 edition of the code under Section 6007 which read as follows: "Section 6007. Load of Branch Circuit. Circuits shall be so arranged that the number of outlets, lamps, and transformers connected to them, shall in no case place more than 15 amps on a branch circuit."



Positive Protection Against Phase Failure and Phase Reversal?

Here is your answer!

The Allen-Bradley Bulletin 812 Type F, Type R, and Type RF relays provide positive protection against the hazards to men, motors, and driven machinery, resulting from phase failure and/or phase reversals.

The Bulletin 812 Style F phase failure relay employs a unique static sensing network that responds to all open phase conditions on a motor branch circuit and immediately removes the motor from the line . . . irrespective of the load on the motor (including no load), or the circuit arrangement. This relay even responds to hard-to-detect primary failures on a wye-delta transformer with ungrounded neutral. Furthermore, the five-cycle response prevents nuisance "drop-outs" from transient fluctuations.

The Bulletin 812 Style R phase reversal relay disconnects the motor from the line—whether it is running or not—when a phase reversal occurs anywhere in the system on the line side of the relay. Thus, it can be employed for a single motor, a group of motors, or an entire power system. In addition, the phase reversal relay prevents the motor from starting should phase failure occur while at a standstill—a vital feature for elevator applications.

The Bulletin 812 Style RF relay combines the elements of Style R and Style F relays for protection against both phase failure and phase reversal. All Bulletin 812 relays are inherently "fail safe." Send for complete information.

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MOTOR CONTROL

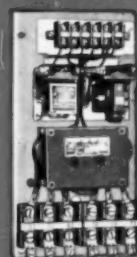
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Bulletin 812, Style RF
for Phase Failure
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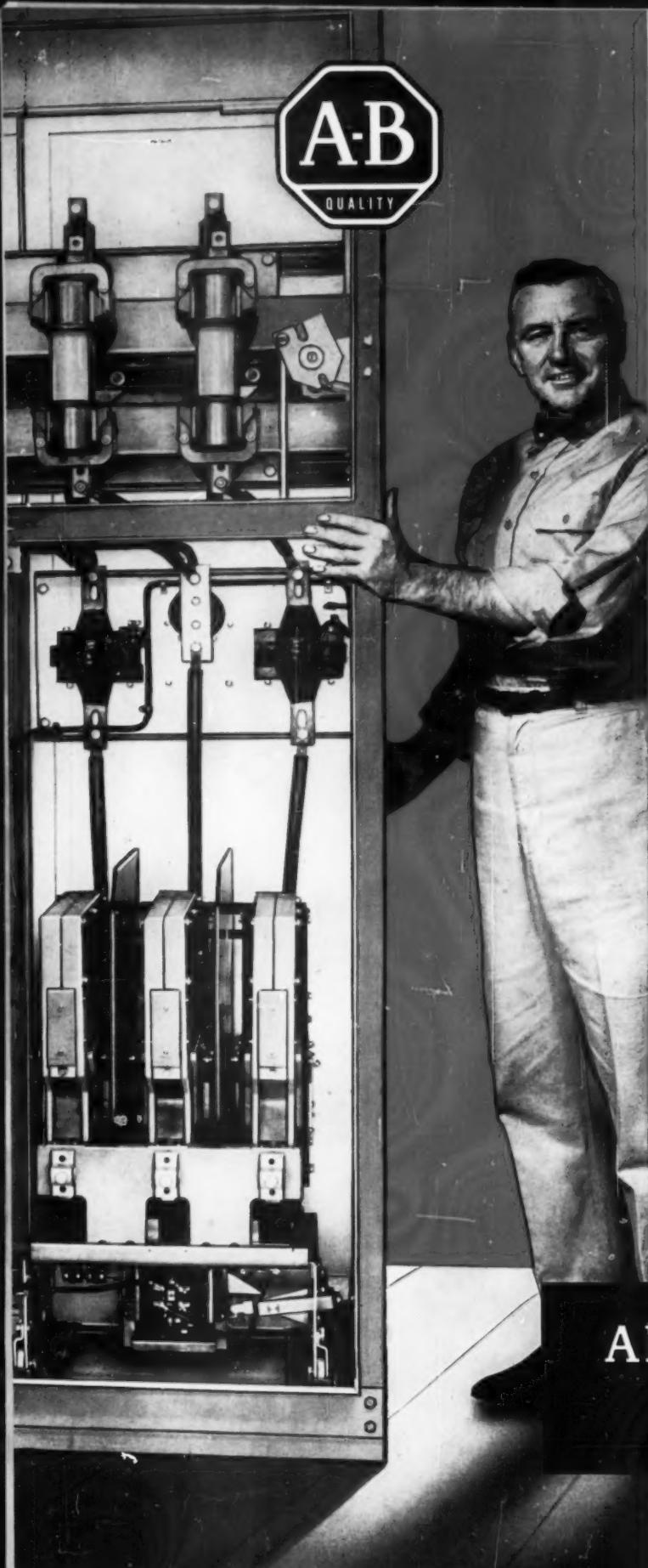


Style F covers full load currents from 1.5 to 300 amp in 4 sizes. Coils for up to 600 v, 60 cycles.

For Phase Reversal



Style R made with coils for 110, 208/220, 440, 550 v for either 50 or 60 cycle operation.



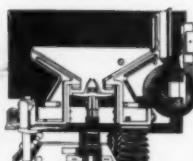
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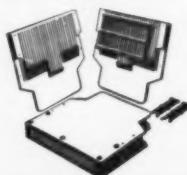
A tremendous operating life has been built into these high-voltage air break starters . . . resulting from the use of the simple solenoid contactor. It's the same design—having only ONE moving part—that provides millions of trouble free operations in Allen-Bradley's low-voltage controls. These starters are made in a complete line for all types of service. Send for Publication 6080, today.



ONLY ONE MOVING PART
With this simple solenoid design, all trouble causing pivots, pins, and flexible jumpers are eliminated. Straight up-and-down motion of contactor is virtually frictionless.



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Allen-Bradley silver alloy contacts never need maintenance . . . they remain in perfect operating condition until completely worn away. Vertical motion assures uniform contact pressure at all times.



FASTER ARC SUPPRESSION
The air break contactor employs a completely different blowout design and novel arc chute which assure rapid arc extinction. Chutes are molded from arc resistant material.

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Practical Methods

Distribution Layout For Machine Shop

DESIGN

Three methods of electrical distribution are effectively combined at E. J. Lavino & Company's new joint machine and electric shop at Plymouth Meeting, Pa. The result is maximum electrical availability,

flexibility of layout, and overhead clearance for crane operation. Instrumental in planning stages as well as installation was Union Electric Contracting Company, Philadelphia, Pa.

Imbedded in an 8-in. thick concrete floor is a Walker power raceway system, comprised of four longitudinal runs, five lateral runs. The raceway system has preset in-



UNDERFLOOR RACEWAY system consisted of four longitudinal and five lateral runs installed in concrete floor, shown here with grouting placed at junction boxes and support points prior to pour.



REINFORCING RODS instead of standard raceway supports were used to anchor the overall system to the dirt floor prior to concrete pour.

serts located on 24-in. centers and was selected as a means of electrical distribution because the system facilitates electrical hook-up of new or re-located machinery. It also affords overhead clearance which is necessary to permit crane operation the full length of the building.

The underfloor distribution system—which includes 2-in. rigid steel conduit used as auxiliary wiring capacity, stubbed up the walls—terminates in wall-mounted junction boxes. From these boxes, cables extend upward through expanded metal cable trough to 225-amp, copper plug-in bus duct. The bus duct is installed in the web of the crane runway I-beam, along both sides for the length of the building. The building was divided longitudinally—each bus duct feeds two runs of duct. Bus duct fusible plug-in units are numbered, and the respective machines electrified by each bus plug are similarly numbered.

Throughout the machine shop area, a wood block floor is installed over the concrete. In this area, junction boxes have 4½-in. high rings, and cover plates are flush with the finished floor. A ½-in. adjustment is provided in the single duct junction boxes to provide precise, final leveling. Corners of boxes are drilled to receive 2-in. conduit. On the concrete floor, boxes are furnished with 2-in. rings and are flush with the finished concrete floor.

The power raceway is oval-shaped and has approximately 17 sq in. cross-sectional area. Duct and boxes are protected against corrosion.



FINISHED INSTALLATION reveals complete freedom from obstructions over and around all machines, provided by the completely concealed electrical distribution system.

BIDDLE IMPULSE CABLE FAULT LOCATING EQUIPMENT

...for locating cable faults by impulse tracer method
...for D-C proof testing

This instrument consists of a high voltage d-c impulse transmitter with pickup coil and pointer-indicating detector. Designed primarily for locating faults on lead-covered cable installed in ducts, this equipment has applications also on aerial and buried cable, and has proved highly effective in utility and industrial service.

The transmitters require only 600 va input power at 115 v, 60 cps supply voltage and therefore can be connected to a lighting system.

MODEL 3-2 FAULT LOCATOR

Transmitter and output voltage up to 25 kv—Discharge capacitance 1.65 muf. Provided with three-range milliammeter for measuring insulation current when proof testing cable or other insulation. For



use on cable up to 15 kv rating.

MODEL 4-2 FAULT LOCATOR

Transmitter output voltage up to 15 kv—Discharge capacitance 2 muf. For use on cable up to 5 kv rating.

MODEL 5-2 FAULT LOCATOR

Transmitter output voltage 5 kv—Discharge capacitance 16 muf. For use on cable up to 1 kv rating. All fault locators can be used on cable with higher voltage rating if fault conditions are favorable.

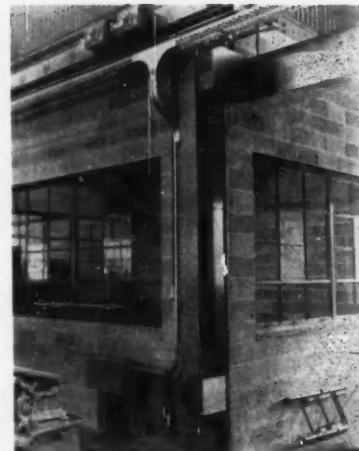


JAMES G. BIDDLE CO.

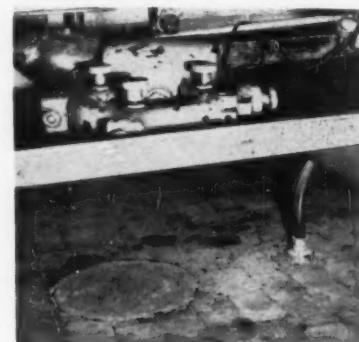
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PLUG-IN BUSWAY is run in web of I-beam along each side of machine area, providing 440-volt, 3-phase power through tap switch to cable carried in expanded metal trough to underfloor raceway junction box on wall.



SUPPLY CONDUCTORS to typical machine are brought out of nearest insert of underfloor system. Cover plate on adjacent junction box is flush with finished wood block floor.

Herman Diesel, electrical engineer at E. J. Lavino, testifies to the advantages of this unique installation which "combines the advantages of underfloor duct, cable trough and busway to meet our particular set of requirements".

Molded Terminals for High-voltage Cables

INSTALLATION

Time savings of 50% over conventional methods are possible in making shielded, high-voltage terminals insulated with epoxy resin using a new method announced by Minnesota Mining and Manufacturing Co. Part of the "Scotchcast" brand resin pressure splice system, the new method uses pre-designed terminal shields of heavy plastic



MOLDED CASE CIRCUIT BREAKERS



I-T-E magnetic trip Type ETI circuit breakers provide readily accessible trip adjustment.

FOR MOTOR APPLICATIONS... ETI BREAKERS INSURE BETTER PROTECTION

Type ETI magnetic trip circuit breakers employ specially designed overload devices to provide pinpoint, instantaneous short-circuit protection. When used in conjunction with motor protective relays, Type ETI molded case circuit breakers represent the ultimate in motor protection.

A new, informative booklet—yours for the asking—explains in detail why Type ETI molded case circuit breakers insure better protection.

As manufacturers of all types of circuit breakers—and the manufacturers of industry's most complete line of molded case breakers—I-T-E offers this booklet as a service to the electrical industry. Small Air Circuit Breaker Division, 19th & Hamilton Sts., Phila. 30, Pa.



**WRITE TODAY FOR
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I-T-E CIRCUIT BREAKER COMPANY
PHILADELPHIA, PENNSYLVANIA

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"Latrobe" Floor Boxes and Wiring specialties are top performers because they are expertly designed of the finest materials.

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Adjustable Floor Boxes are bonded which makes them fire-proof—come in single round or square bodies—also furnished in square single gang, two gang, three gang and four gang types.

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Represents the last word in unique design, neat appearance, fewest number of parts, and least amount of labor to install.



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Fasten porcelain or glass insulators to steel framework without punching holes. 4 sizes—1", 1½", 2" and 2½".

"Latrobe" Pipe or Conduit Clamp

This clamp is made with a double safety bite of case hardened tool steel. Two models—Right Angle and the Parallel support. Each model comes in 10 sizes to handle pipe or conduit ½" thru 4".

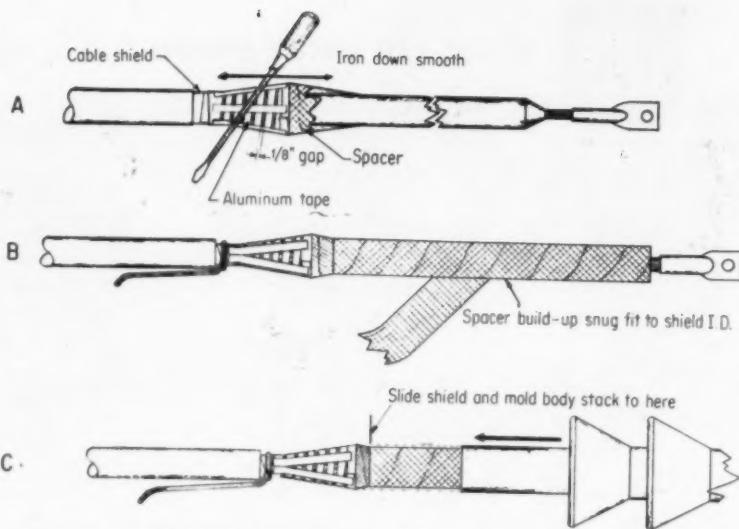


Latrobe Products

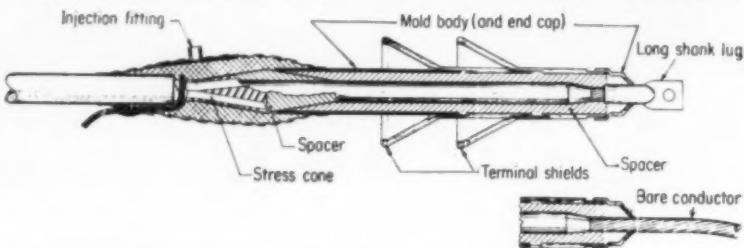
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Adjustable Floor Boxes
Gang Boxes—Cover Plates
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ASSEMBLY PROCEDURE (starting at top) begins with removal of cable sheath and removal and penciling down of insulation at the end of conductor. A stress cone is built up of spacer tape and covered to the center with spirally wrapped aluminum tape. Four longitudinal strips of aluminum tape are spaced equally around the cone, tying in the original shielding. This taping is then ironed smooth (at A) with the round shank of a screwdriver. Next (at B), porous spacer tape is built up around the conductor insulation to the inside diameter of the mold body. Then (at C), the mold body, with the terminal shields in place, is slipped over the built-up spacer tape and moved to the left up to the stress cone.



FINISHED TERMINAL for a typical 10-kv cable end looks like this before injection of epoxy resin. Nozzle of pressure gun is inserted in injection fitting and the resin is forced into the assembly under pressure. Small vents are provided to assure complete filling of terminal.

slipped over a plastic tube closed with a stepped end cap to fit various cable sizes. The terminal shields are cone shaped and are of the "building block" or interlocking type. They are slipped on the body tube to form a stack of shields appropriate for the operating voltage of the cable.

Using the new method, identical terminations can be made time after time with a minimum of skill and training, since the critical sections are pre-designed. Little chance of inadequate insulation or workmanship error exists if the manufacturer's directions are followed. Each terminal shield is rated at 5 kv, and may be used in combination up to 15 kv. They provide a properly designed, leakage-resistant exterior surface suitable for weather-exposed service, according to the manufacturer.

The termination is made in five steps:

1. The prepared cable is wrapped with a screen-like spacer tape, building up a double-ended cone. The cone is wrapped spirally with aluminum tape from the cable shielding to the midpoint, continuing the cable shielding, and forming a stress cone.

2. The cable insulation is wrapped with spacer tape from the end of the stress cone to the end of the cable insulation. This wrap is thick enough to make a tight fit inside the mold body.

3. The mold body with the proper number of shield cones is slipped over the spacer tape wrap and pushed down to the unshielded end of the stress cone.

4. The stress cone is wrapped with a half-lapped layer of plastic electrical tape, starting on the ca-



Exclusive SPANG HEADERDUCT features include corner leveling screws and square access and junction boxes. These mean easy installation, and easy, low-cost future wiring changes—both savings in man-hours.

SPANG HEADERDUCT

saves installation time, provides flexible wiring system in National Bank of Detroit new main office

SPANG HEADERDUCT saved valuable time for J. Livingston and Company, electrical contractors for the National Bank of Detroit installation. First: the access boxes are square—this means maximum working area for making wiring connections. Secondly, corner leveling screws on access and junction boxes make leveling fast and easy.

According to Job Superintendent, Mr. John C. Gnass, "We saved 25% installation time. No time-consuming leveling with a transit was required; this enabled us to free workers for other jobs around the building."

SPANG HEADERDUCT, installed in the National Bank of Detroit new main office in conjunction with cellular-type construction, has access boxes every 36 inches. This permits as many electrical and telephone outlets as the building tenants require . . . both now and in the future. Old outlets are easily sealed up. Access boxes are readily located, and wiring may be added as needed.



J. Livingston and Company, one of the largest and oldest electrical contracting firms in the country, used 19,000 feet of SPANG HEADERDUCT in the National Bank of Detroit new main office.

Architect: Albert Kahn Associated Architects & Engineers, Detroit.

General Contractor: Bryant and Detwiler Company, Detroit.

SPANG Distributors: Splane Electric Supply Co., Cadillac Electric Supply Co., McNaughton-McKay Electric, and Madison Electric Supply, Detroit.

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Beware of inferior screw anchors

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Your **RAWL** distributor has a complete stock of Rawlplugs, hand or power Rawldrills for masonry drilling, and a full line of other masonry anchoring products. To help you select the right masonry anchor for your job, he'll gladly give you your complimentary copy of the "Masonry Anchoring Handbook." Ask him for it or write us . . . it's free.



RAWLPLUGS
screw anchors for all types of masonry



RAWL SCRU-LEADS — lead screw anchors



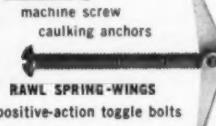
RAWL LAG-SHIELDS
rustproof lag screw shields



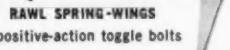
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masonry drills for hand, power drilling



RAWL CALK-INS



machine screw
caulking anchors



RAWL SPRING-WINGS
positive-action toggle bolts



THE RAWLPLUG COMPANY, INC.

212 Petersville Road, New Rochelle, N. Y.

ble sheath and ending on the mold body. When the wrapping is half finished, a plastic injection fitting is placed on the spacer tape and the wrapping continued to seal it into the wrap. Then a wrap of cloth "restrictor" tape is applied, covering the plastic tape but leaving the injection fitting open. The plastic tape has "give" like an inner tube and will expand when resin is forced in under pressure. The "restricting" tape acts much like a tire casing to restrict this expansion.

5. Epoxy resin in the special "Unipak" container is prepared (by breaking the divider and squeezing the plastic envelope to mix the resin parts) and the envelope is placed in the pressure gun. This gun is much like a caulking gun. The gun nozzle is placed in the injection fitting and the resin forced into the termination under pressure by squeezing the trigger. Chemical action cures the resin into a tough, moisture-resistant insulation mass. The new method may be used to terminate lead, rubber and plastic sheathed cable; or combinations of these, as well as shielded cable. Application is generally the same for all types.

Exact build-up dimensions for various insulation values required can be obtained from local electrical distributors or the manufacturers of the particular cable.



THREE 250-KVA pole-type distribution transformers, installed for Kansas City Power and Light, extend ratings in the line of pole top distribution transformers from 167 kva, previously the largest pole-type units made. These new units are especially suited for application in areas where bulk power demands are served from pole top. Each unit weighs about 1700 lbs, only about 300 lbs heavier than the 167-kva unit and well below standard weight limits for pole mounting.

Accent on Excellence

Youngstown "Buckeye" steel conduit

At Carling's ultra-modern \$10 million plant recently erected at Atlanta, Georgia, Youngstown "Buckeye" Full Weight Rigid Steel Conduit was installed for lifetime protection of the brewery's all important electrical wiring system. That's because steel conduit is today's *only* method of wiring protection approved by the National Electrical Code.

When you specify "Buckeye" Conduit, the high standards of Youngstown *quality*, the personal touch in Youngstown *service* will help you create electrical wiring systems with an "accent on excellence".

**Carling Brewing Co.,
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ARCHITECTS:
Designed by Carling Brewing Company
GENERAL CONTRACTORS:
Beers Construction Co., Atlanta, Georgia
ELECTRICAL CONTRACTOR:
White Electrical Construction Co., Atlanta, Ga.
"BUCKEYE" CONDUIT SUPPLIED BY:
Electrical Wholesalers, Inc., Atlanta, Georgia



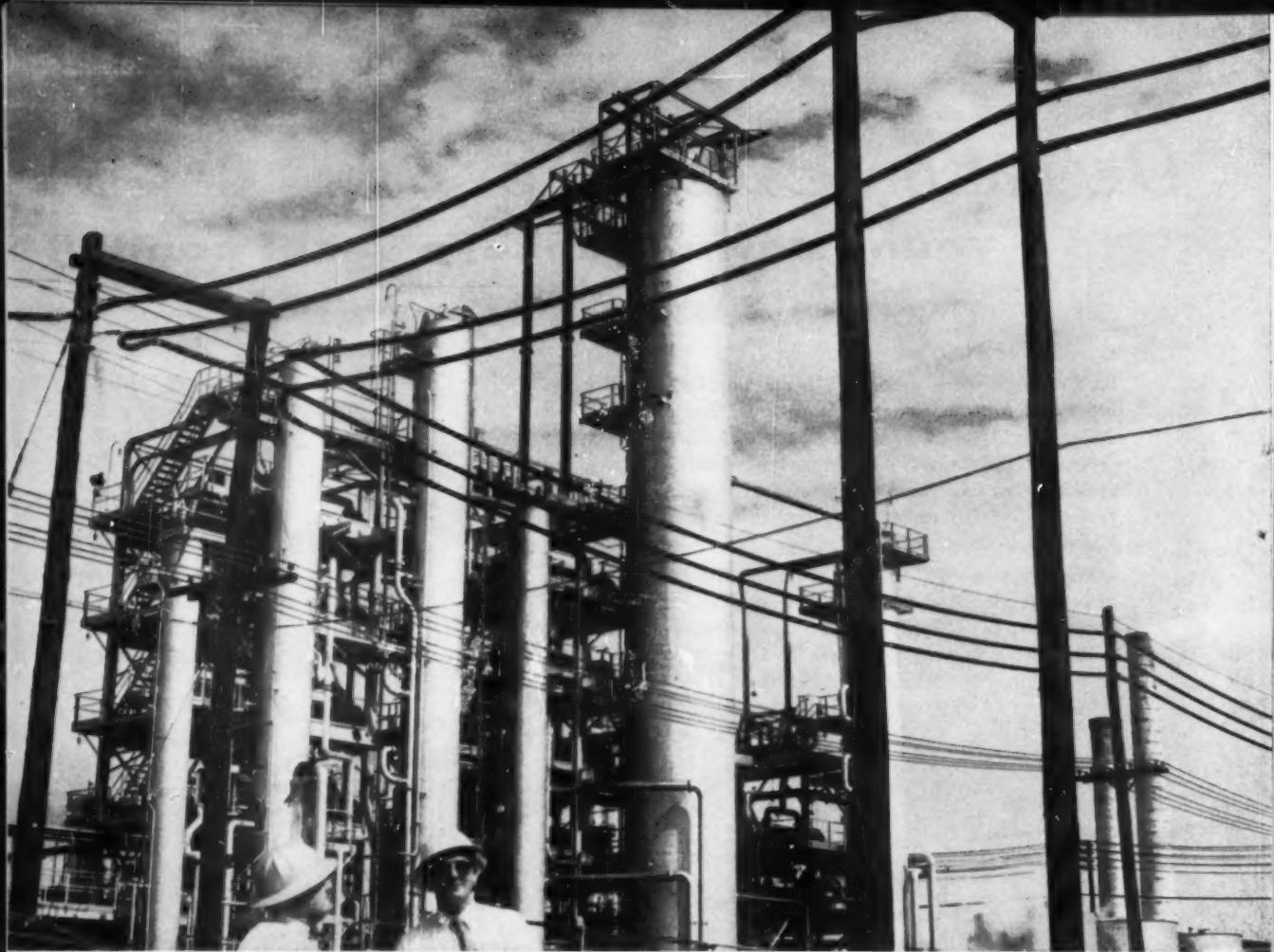
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**Carefully selected
Continuous Weld pipe**

is first accurately threaded. Next, the pipe is thoroughly cleaned by pickling. Then it is immersed in a bath of molten pure zinc. A special process is used to remove it from this bath so that a clean, smooth zinc coating remains on both inside and outside. Then a coating of tough, transparent lacquer is baked on both inside and outside surfaces, providing a smooth raceway through which wires may be easily fished. This is Youngstown's long-lasting, trouble-free, easy-bending hot galvanized Buckeye Conduit.



Okonex-Okoprene 15kv primary distribution cables solve Magnolia Petroleum Company's space problem and climate problem (wet and salty atmosphere) and provide greater safety in its Beaumont refinery.

Magnolia Refinery improves voltage regulation, beats humidity with Okonex-Okoprene cables

The giant 1,500-acre Magnolia Petroleum Company refinery, located on the broad Gulf Coast Plain, generates and uses 900,000 kilowatt hours a day, more than its neighboring city of Beaumont, Texas. A cable breakdown here could cause costly damage to equipment and the material in process (more than 400 oil products are manufactured). The entire cable system must serve Magnolia's round-the-clock operation without interruption in the face of the high moisture-saline content of the air, plus the chemicals and

intense heat used at many of the processing units.

For the 15kv primary aerial loop distribution system, Magnolia's engineers selected shielded Okonex-Okoprene cables. These butyl-base insulated, neoprene-sheathed constructions saved space, eliminated safety problems and provided improved voltage regulation far superior to previous open wire constructions and other insulated cable constructions studied. In addition, their excellent moisture, heat and corrosion resistance were important

assurances of maximum service life.

Okonex-Okoprene, in 3,000 to 15,000 volt constructions, was also used for trunk feeders to and from substations, tie lines and motor leads installed both aerially and underground.

To help you specify the optimum cable for your important power and control cable needs, contact your Okonite representative or write for the free Bulletin EC-1117, "How to choose insulated cable," to The Okonite Company, Passaic, New Jersey.



where there's electrical power . . . there's

OKONITE CABLE

NECA Meetings Focus on Management Problems

Employee referral methods, sales training and mechanized accounting are among key industry developments discussed at record electrical contractor convention and trade show in Dallas, Texas.

HIRING procedures which preserve the valuable features of traditional industry practice and still comply with the ban on closed shops in the Taft Hartley act were reviewed by electrical contractors attending the 57th annual convention of the National Electrical Contractors Association in Dallas, Tex., Nov. 19-22. The long moratorium given the construction industry by NLRB to permit an orderly transition ended Nov. 1 and referral procedures adopted in various areas were discussed at length in the meetings and the lobbies. Sales and management training for electrical contractors to encourage better business methods and to build the market for the goods and services of the industry were explored in presentations and committee discussions. The convention theme "Electrical Contracting is Our Business" pointed up the large areas of electrical construction work performed by others and sought concerted efforts toward enlarging the role of the electrical contractor.

The Referral Problem

Jerome D. Fenton, General Counsel of the National Labor Relations Board, reviewed the traditional procedures for hiring labor in the construction industry and discussed rulings of the NLRB on hiring hall and job referral practices. In the past, unions have maintained hiring halls and assumed full control and responsibility of job referral for employment in the industry. The hiring hall has been an integral part of the closed shop system. But certain characteristics of the old hiring method have come into conflict with existing legislation. Mr. Fenton discussed the relation of ex-

isting legislation to labor agreements in which the local union is to act as the exclusive source of employment applicants. The presentation was aimed at providing a guide to smooth transition to legally acceptable hiring methods.

In the case of Mountain Pacific Chapter of the Associated General Contractors, the NLRB decided that a hiring procedure was illegal because the contract provided sole responsibility for job referral to the union, without specifying any method of referral. The union, in that case, had complete and uncontrollable hiring discretion. Under such an arrangement, it was necessary for mechanics to be within the good graces of the union in order to find employment. The employer had relinquished all control of the hiring function.

Mr. Fenton made it very clear that the Board has not furnished any employer or union with a ruling that any form of agreement on hiring procedure is acceptable. They can pass only an unfair labor action. And he warned against interpreting his remarks to be anything other than a discussion of pertinent factors by an individual familiar with the problem of hiring methods. However, he did set down his understanding of minimum requirements for a legal hiring procedure, as follows:

1. Selection of applicants for employment shall be made without discrimination and completely independent of membership or non-membership in the union.

2. The employer must retain the right to reject applicants whenever he sees fit.

3. The parties to the contract must post all provisions relating to hiring.

According to Mr. Fenton, it is not enough to disavow intent to

discriminate. There must also be proper safeguards against coercion or restraint, to keep operation of the hiring process on a constantly legal, non-discriminatory basis. Establishment of proper hiring procedures must be based on existing federal and state labor legislation which prohibits discrimination on the basis of union membership.

Gordon Freeman, International President of the IBEW, reviewed some of the current problems which the union is working on:

1. Development of a legal hiring hall process to meet all requirements of the NLRB, while protecting both parties in labor agreements.

2. Settlement of problems arising from an increasing practice on the part of industrial plants to do new construction work with their own forces instead of electrical contractors. He pointed out that the union has always differentiated between new construction and maintenance work. New construction should go to electrical contractors.

3. Continuing opposition to state right-to-work laws everywhere.

4. Opposition to bid-shopping, consistent with their past support of anti-bid-shopping legislation.

5. Continuing support of the position that all electrical workers should do all electrical work and should bid on all electrical work.

6. Reduction in the amount of electrical work going to non-union contractors.

Freeman noted that in 1958, the supply of electrical workers exceeded the demand for them. For the first time in many years, there was demand from employees for work. This, he said, could be remedied by an increase in construction activity. And he cited

closer cooperation between IBEW and NECA as a stepping stone to better times for the electrical construction industry.

Boosting Free Enterprise

Tony Whan, senior vice president, Pacific Outdoor Advertising Company, gave a rousing and entertaining address on the importance of the free enterprise concept to the health of the national economy. He pointed out the stake that electrical contractors—as leaders in our capitalistic economy—have in promoting, with enlightened self-interest, aggressive but moral business competition. He warned that business enterprisers—as certainly all electrical contractors are—have the most to lose when collectivist schemes or legislation prevail. The tide of battle has been going against the traditional American concept of vigorous free enterprise. According to Whan, it is time business men realized that they must not only wage business but must wage the battle for survival of our form of economic system. He stressed the need for understanding the philosophical basis of our system and for energetic proselytising to our system.

The expanding market picture was outlined in a series of presentations involving the gathering of local industry statistics, an example of research interviewing of typical customers of electrical contractors to determine what the public wants in the way of electrical services, and a dramatization of the rapid growth in popularity of electric heating.

C. A. Tatum, president, Dallas Power & Light Company, presented the new utility industry promotional program, the Edison Electric Institute's Electrical Living for 1959. The program is focused on one basic objective—to sell more electric appliances—more wiring and more lighting in the homes of America. It is made up of three parts:

First is the appliance and Medallion Home program, which was launched by the electrical industry last Spring. Adequate wiring in such homes is a most important factor and offers the electrical contractor an opportunity to "sell up"—which means more profit.

Second, to increase the wiring capacity of American homes through the Housepower program.

Third, to increase profitable lighting loads by selling more lamps and lighting fixtures.

A research study of all installed



AT A RECENT TOUR of Montreal Armature Works, Montreal, P. Q., NISA president Paul Sievert (left), of Sievert Electric Co., Chicago, and F. C. Fenwick, of Montreal Armature Works, hear John Clermont, Leduc Electric, Montreal, discuss a shop procedure.

electrical systems for power and light, communication and electronic and electrical controls indicated that the value of this electrical craft work in 1957 amounted to \$14.4 billion. Our industry faces a tremendous challenge to expand to meet this need for safe and adequate installations, Oliver F. Burnett, President of NECA, said. When you take into account that the electrical industry is doubling every ten years and that by 1980 there will be four complete utility generating, transmitting and distributing systems where there is one today, you get the picture of our problem to increase both our management capacity and our skilled labor force. These are some of the basic things this meeting will be considering and they are complicated by shifts in industry practices and union equilibriums.

The increasingly important role of atomic generation of electric power was discussed by Oscar S. Smith of the Atomic Energy Commission. He stressed the need for technical training to adapt to working close to radiation hazards and to expand skills for the wider and more intensive use of electrical energy.

Clint J. Harder, secretary-treasurer of NECA, reported that as of November 14 the membership was 4,115 and NECA now has 121 Chapters, having chartered the Central Louisiana Chapter in District 3, the Northern Illinois Chapter in District 4, the Southwest Missouri Chapter in District 7, the California-Nevada Line Constructors, the San Mateo County and

the Kern County Chapters in District 9.

The steps the Association is taking to improve management capabilities by its management training programs were outlined in a series of skits. They included demonstrations of the adaptation of a mechanical bookkeeping system to the industry's requirements, estimating techniques, workshop methods for keeping managers and prospective managers up to date.

Also a demonstration and film was shown outlining the imperative need for safety precautions in the industry. The presentation was by C. C. Haggard, director of safety, California-Oregon Power Co. The importance of safety precautions and safe wiring to reduce electrical accidents was dramatically demonstrated.

Association Officers

The introduction of district vice presidents for the association was made by Oliver Burnett, president, as follows: Harold Webster, Dist. 1; John Beck, who is also vice president-elect, Dist. 2; Carl Teal, Dist. 3; Joe Albright, Dist. 4 and E. E. Leisure, vice president-elect, Dist. 4; Cliff White, Dist. 5; Wes Grasle, Dist. 6; Dick Osborn, Dist. 7; Phil Robbins, serving the unexpired term of Ralph Johnson, Dist. 8 and Bud Rowe, vicepresident-elect, Dist. 8; Del O'Connor, Dist. 9; and Charles Moseley, Line Construction.

Committee Reports

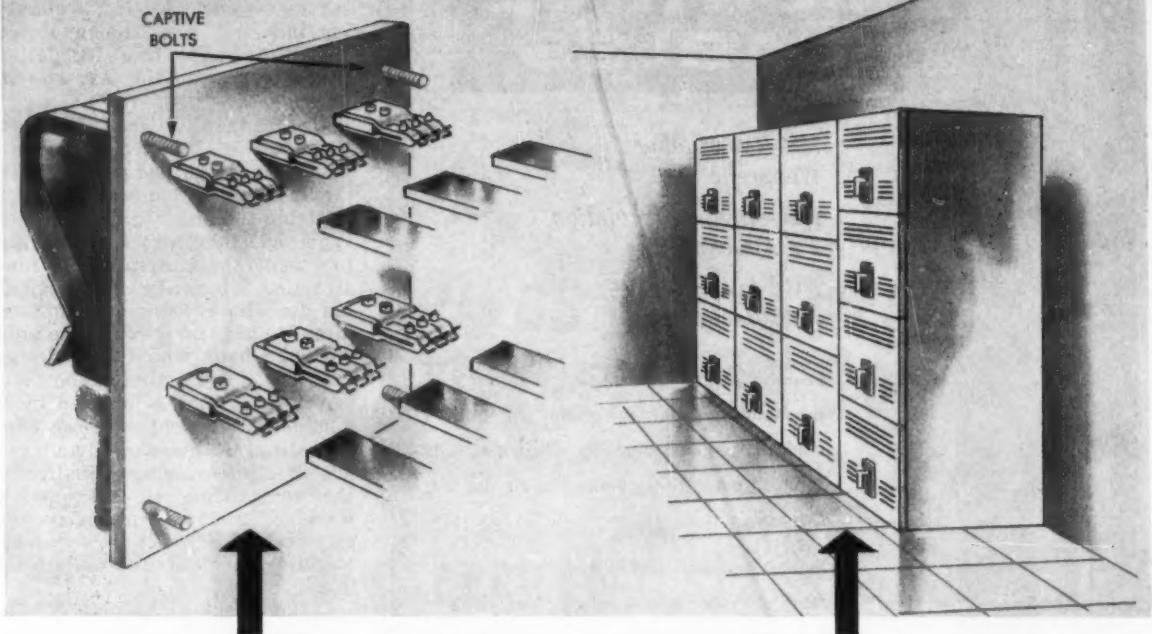
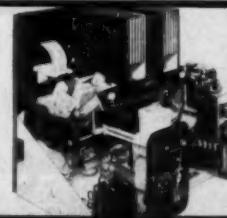
Important developments in establishing fair bidding practices in the construction industry, making industry hiring hall practices conform to the Taft-Hartley Act, and significant market information resulting from research activities were reported to the Board of Governors of NECA.

The reports were from Standing Committees of the Association and from staff officers and directors.

Big news for the industry came in an announcement by Edwin Pewett of Weaver & Glassie, Washington, D. C., NECA's general counsel, that Assistant Attorney General Victor R. Hansen has granted the industry a "railroad release" clearance for the establishment of a bid depository plan. The plan cleared was for the Minnesota (St. Paul) Chapter, but it is regarded as a precedent for a general industry approach to correcting the unethical practices known as bid shopping and bid peddling which the Antitrust Division of the Justice Department

MEARS

LOW VOLTAGE
AIR CIRCUIT
BREAKERS



Breaker disconnects from main bus without killing board

The removable Mears circuit breaker shown above is one of three Mears types available to engineers and switchboard manufacturers: (1) Fixed (2) Removable (3) Drawout (on sturdy trucks with permanently lubricated ball bearing wheels).

The Removable type provides many advantages of the Drawout, but at lower cost; namely: can be disengaged from main bus for inspection or service without total switchboard shutdown.

Front connections are not necessary where it is desired to put switchboard against wall, since removal of breaker allows easy access to rear connections from the front of the board.

Isolating contact fingers are of high pressure, free floating, self-aligning type, with silver-to-silver surfaces.

Safety interlock trips breaker when cubicle door is opened.

High quality of Mears engineering is indicated by list of features at right. For more data call our representative.

Switchboard against wall—no rear access or front connection required

Mears circuit breaker features

- Both electrical and manual operation.
- Low operating temperature.
- Sintered silver contacts.
- Shockproof.
- Vertical plane design.
- Dustproof.
- Anti-bounce.
- Operating torque with 300% safety margin.
- Light tripping action.
- Low maintenance.
- Extra wide range of ratings (can be sized to job).
- Only West Coast breaker manufacturer.
- Fast Delivery.
- 100,000 Amp interrupting capacity,
- 6000 Amp continuous.
- Fixed, removable and draw out units.
- The widest selection; 5 extra sizes.

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AIR CIRCUIT BREAKERS



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STATION CONTROL CABLES

*RH-RW Rubber Insulation
Neoprene Jacket*

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Because Whitney Blake specializes in the manufacture of high quality wire and cables you will obtain long, efficient service from Whitney Blake Station Control Cables.

Rubber insulated and PVC insulated types are rated at 600 volts; polyethylene insulated types at 1000 volts. All are manufactured to IPCEA Specification S-19-81. They are designed for aerial, duct or direct burial installation.

Whitney Blake Station Control Cables can be supplied to your specification or designed for your application. Write for information on special constructions or for complete data on standard types.



WELL BUILT WIRES SINCE 1899

WHITNEY BLAKE COMPANY

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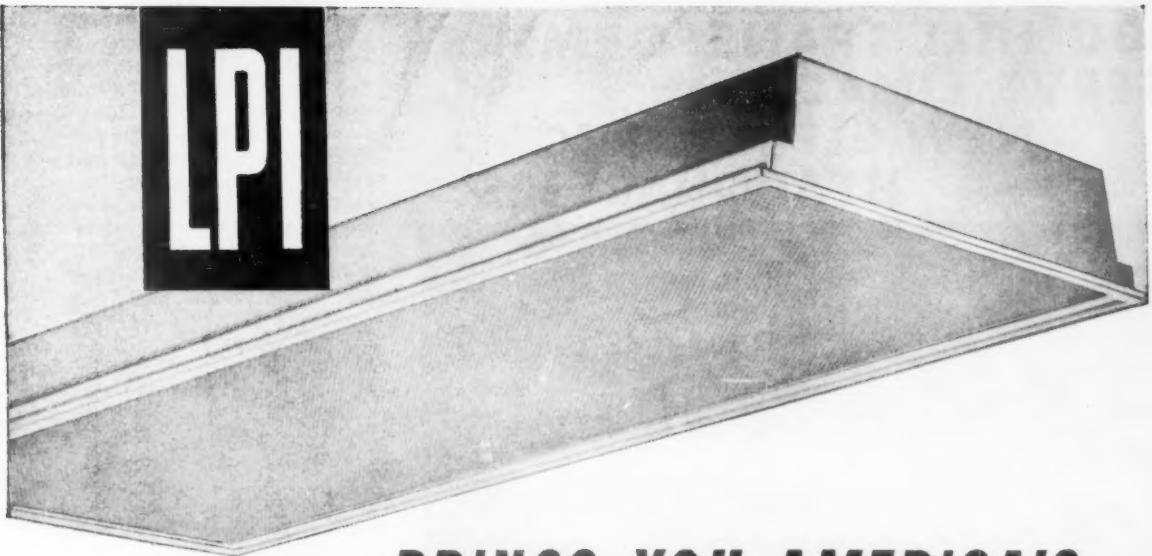
now regards as anti-competitive. This change in attitude resulted directly from the six-year legislative battle led by NECA and the Council of Mechanical Specialty Contracting Industries to secure enactment of fair bidding procedures for the federal government that would outlaw bid shopping and bid peddling as unfair trade practice. Due to a sudden reversal by a faction in the plumbing industry, who had supported this legislation, this legislation failed to pass in the last session of Congress.

Under the "railroad release," the Justice Department serves notice that it will not proceed with any criminal action as a result of applying the plan. Under the plan approved, subcontractors bidding to a general contractor on a construction job notify a designated bid depository, usually a bank, of intent to bid and then file the bids with the bank which at a designated time opens them. The plan is voluntary and is financed by a nominal assessment on those participating. It has the advantageous effect of bringing a finality in the competition on subcontract work and making a public record of the bids, thus discouraging chiseling and under-the-table dealing.

In announcing the plan NECA issued a stern warning to its members and to the industry that they must make sure that the plan is not used as "a cloak for bid rigging, price fixing or other restraint of trade."

Chairman A. B. Weinfield of the NECA Governmental Affairs Committee took note of the progress that has been made in educating the industry, the public and government officials on the adverse consequences of unfair bidding practices. He said that the only serious blow from the failure to enact the Federal Construction Contract Procedures Act (H.R. 7168) in the last Congress was that the industry failed to gain the legal basis to carry on effective cooperation in the industry. The Justice Department action in the "railroad release" clearance of a bid depository plan accomplished a part of that.

The Committee recommended that NECA cooperate through the Council of Mechanical Specialty Contracting Industries in initiating a congressional investigation of "flagrant abuses of the contract system by federal construction agencies."



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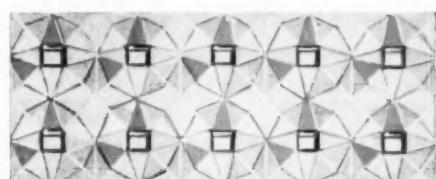
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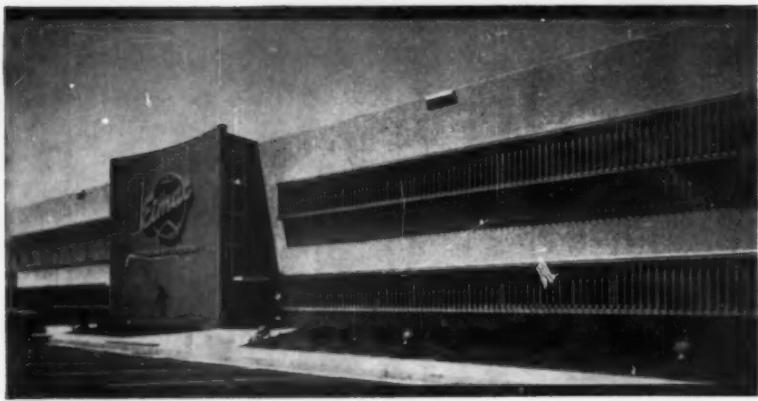
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Electrical Contractor: Biber Electric Co., San Carlos, Calif.

Space-saving HILL wall units conserve valuable manufacturing space. They are 25 KVA—Dry type—80° rise—1 phase—60 cycle—480 volts to 120/240 volts—internally rubber mounted for minimum noise level.



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OIL FILLED • ASKAREL • DRY TYPES
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Available through leading electrical wholesalers.



Chairman Oliver F. Burnett of the Executive Committee, which functions as the Labor Relations Committee, told of the requirements of the National Labor Relations Board that the construction industry bring its hiring hall procedures into conformity with existing laws and regulations. A suggested referral system has been proposed to the industry.

Chairman F. E. Keith of the NECA Marketing Committee reported that the two-year market research program undertaken the first of this year is ahead of schedule and that information is being assembled. The study indicated that the potential of the electrical contracting market is much greater than heretofore estimated, and not only justifies but demands expansion of management capacity and labor skill. This first study of what constitutes the "electrical craft market" revealed that in 1957 it totalled \$14.4 billion. This is the value of installed electrical work of all kinds, including communications, electronic as well as conventional electrical systems for power and light. It does not include appliances.

The Marketing Committee called attention to an interesting research study just released by the University of Illinois. It concerns the effect of restrictive labor agreements that industrial and utility management sign with production workers limiting management's right to contract for construction and maintenance work with outside firms when it is deemed to the company's advantage to do so.

Chairman Arthur E. Bertke of the Inter-Industry Committee reported important strides have been made in inter-industry cooperation through the council of Mechanical Specialty Contracting Industries which this past year participated in a National Joint Cooperative Committee with the Associated General Contractors and have set up a similar liaison group with the Consulting Engineers Council. An important development is the Statement of Principles of Ethical Conduct for the Construction Industry to which major groups in the construction industry have announced adherence. Programs of cooperation with other electrical industry groups through the National Wiring Bureau, the National Lighting Bureau, the Industrial Electrification Council and the National Electrical Week Committee were



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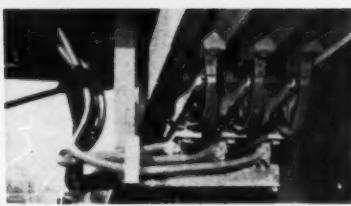
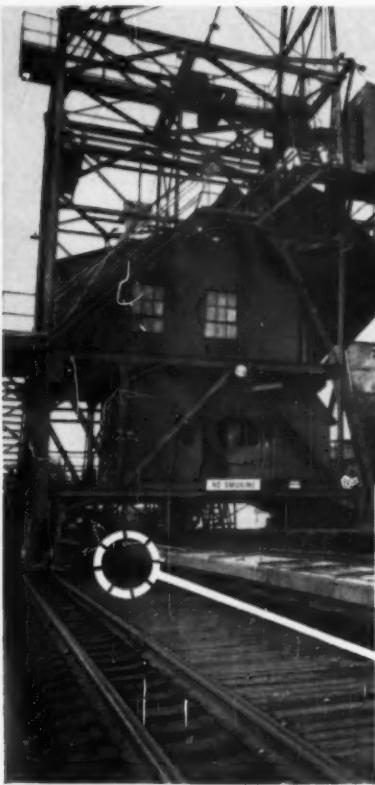
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Detail of Delta-Star 440-volt, 100-ampere a-c conductor and collector system on ship-unloader at Philadelphia Coke Company. Note close spacing of conductors, which results in lower voltage drop, higher efficiency.

LOW LOSSES=MORE TONS PER HOUR with new DELTA-STAR crane conductors

Philadelphia Coke Company has modernized and speeded its unloading and quenching operations by replacing two steel crane conductor systems with Delta-Star aluminum systems. The photographs show the new 381-ft. Delta-Star installation on the gigantic ship-unloader.

Switching to Delta-Star aluminum conductors has given Philadelphia Coke greater efficiency by reducing the reactance drop along the runway. In addition, downtime for repairs has been drastically reduced by assuring proper tracking. These collectors do not hop off, even where the conductors become misaligned by expansion of the coke oven. And surer contact in a highly corrosive atmosphere is provided where rusted steel conductors had often failed. Finally, the overall installed cost of

the Delta-Star system did not exceed that of steel.

Also installed, but not illustrated, is a 747-ft. 500-ampere d-c conductor system on the quenching-locomotive runway. Increased efficiency and productivity were immediately apparent with both the new Delta-Star aluminum conductor systems.

Similar Delta-Star systems are in use on runs as short as 50 feet and as long as a half mile, with voltages to 4160 and amperages to 6000, on cranes, ore bridges, and other heavy equipment. Available with aluminum, bronze, or copper conductors. Complete engineering service to meet your needs. Call your nearest Delta-Star representative, or write Dept. 509, Delta-Star Electric Division, H. K. Porter Company, Inc., 17th & Cambria Sts., Philadelphia 32, Pa. District offices in principal cities.

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DELTA-STAR ELECTRIC DIVISION

outlined. A national joint liaison committee with the National Industrial Service Association has been formed to exchange motor repair industry information.

Chairman Fred Oertli of the Manpower Development Committee reported that though the spread of apprenticeship and training programs in the local areas was not all that could be desired very substantial progress has been made. There are today 398 agreements providing apprenticeship programs where there were but 84 in 1953. There are 34 fulltime area directors at work now compared to 11 in 1954. This year 72 completion ceremonies were held, twice as many as four years ago, and this year 2,282 completion certificates were issued compared to 905 in 1954.

Co-chairman E. R. Edenfield of the Council on Industrial Relations noted that the past year has been the busiest in the Council's 39-year history and they have heard and decided 85 dispute cases. This activity prevented many serious work stoppages.

Chairman C. W. Moseley of the Line Construction Committee reported that the organization of regional line constructor chapters is now almost complete with seven such chapters in operation with a membership of 138 of the country's key line construction contractors. The final chapter is scheduled to be established in the Southwest this coming year.

Resolution

It has come to the attention of the NECA that some electric utility companies are installing or plan to install service entrance equipment with their own work forces. Electrical contractors have by practice or custom provided the material and handled the installation of service entrance equipment as an integral part of the wiring system installation in the building.

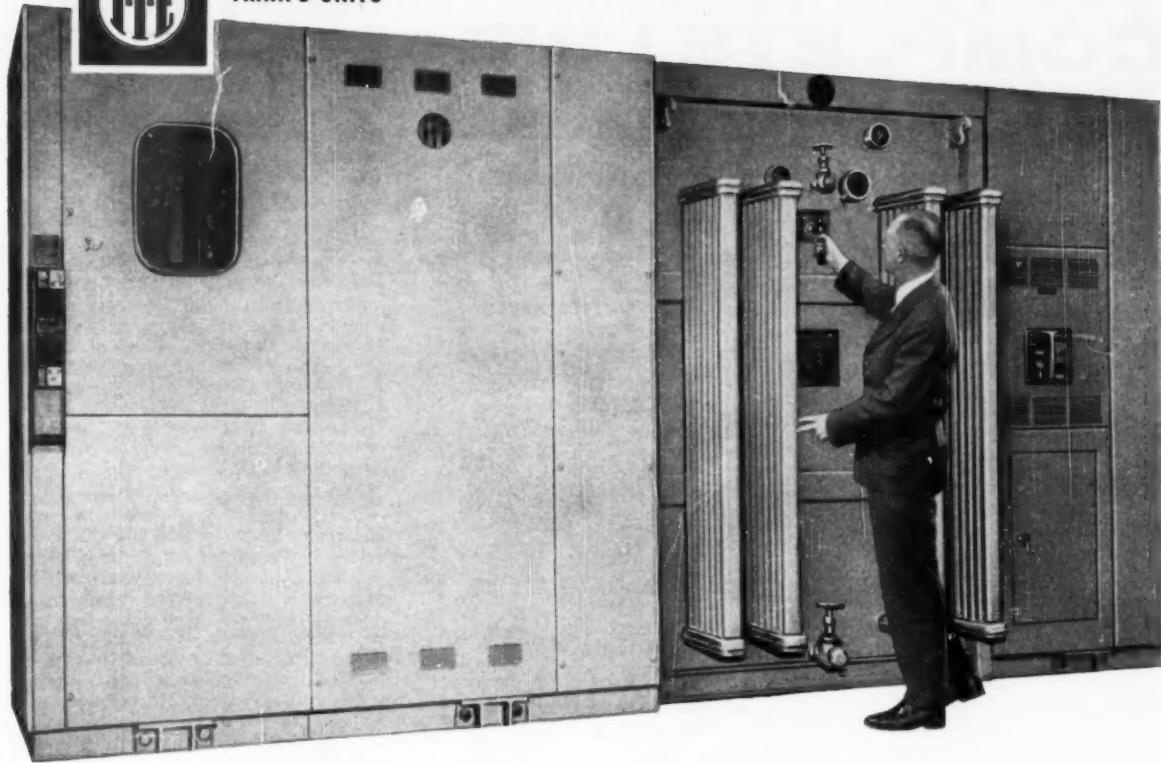
To face this problem a resolution passed at the Convention declared that all installations of service entrance equipment be performed by qualified electrical contractors and that the NECA Headquarters office be alert to participate in any industry conference on this subject.

Coggeshall Award

William H. Biester, Jr., president of the Electro Construction Company of Philadelphia, received the second Coggeshall Award for the most outstanding service this year in advancing safety codes and



TRANFO-UNITS



Neat, compact and completely self-contained—a practical, economical way to bring in your electric power at low cost higher voltage.

COMBINES DISCONNECT, TRANSFORMER AND SECONDARY CIRCUIT BREAKERS

More compact than a substation . . . better looking than combinations of loose equipment, yet no more costly . . . here is everything you need in many applications to buy power at economical high voltages.

Every I-T-E Tranfo-Unit is completely assembled and wired at the factory, and no live parts are exposed to contact by personnel. It is normally shipped as a single package. But heavier units are split for easier handling. There is no complicated assembly at the site. You simply position it, connect it, and it's ready for operation.

There is nothing else to buy—no additional engineering required.

For supermarkets, schools, office buildings, factories and many other power uses, the I-T-E Tranfo-Unit means new safety, new ease of installation, new improved appearance for power entrance equipment. Available in ratings from 45 through 3000 kva, primaries through 14.4 kv, secondaries through 600 v. For literature, write I-T-E Circuit Breaker Company, Transformer & Rectifier Division, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada: Eastern Power Devices Ltd., Port Credit, Ont.

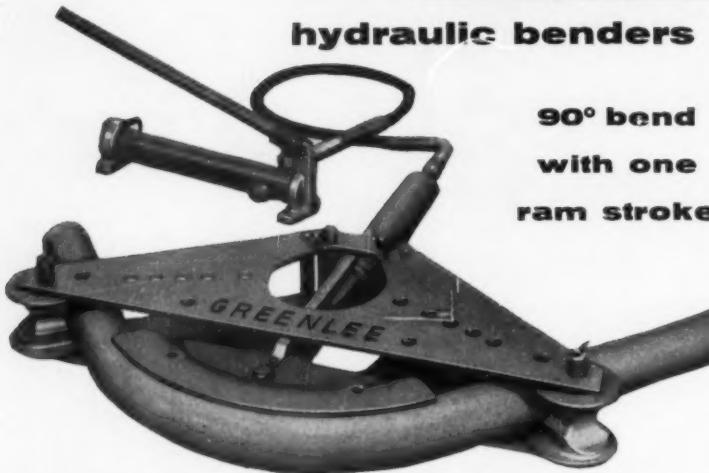


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of fast LIGHTWEIGHT
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NEW No. 883 for 1/2"-3" pipe and rigid conduit.

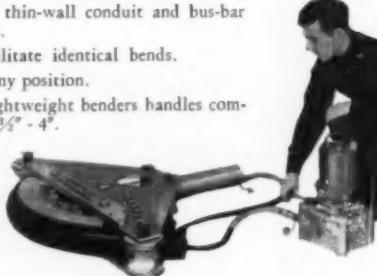
Completes the GREENLEE unique line of fast, convenient, lightweight hydraulic benders. Makes quick, smooth, accurate bends of any size up to 90° with one ram stroke. Operates with GREENLEE No. 798 Power Pump or No. 768-M4 Hand Pump. Easily wheeled from job to job on pipe supports specially designed to serve as rollers. Has all these advantages in common with the other GREENLEE lightweight benders:

- High-strength aluminum and steel construction for minimum weight, maximum strength.
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- Easily portable by one man.
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- Conduit or pipe inserted and removed from front of bender.
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 - Built-in gauges facilitate identical bends.
 - Benders operate in any position.
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For sizes $\frac{1}{2}''$ - 4". Operates with GREENLEE No. 798 or No. 797 Power Pump or No. 726 Hand Pump.



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standards in the electrical industry.

The citation read:

"William H. Biester, Jr., has during this past year made a signal contribution to the advancement of codes and standards in the Electrical Contracting Industry by bringing to its members comment and interpretation based on a lifetime of experience and dedication to this important activity. As Chairman of the Codes and Standards Committee of the National Electrical Contractors Association, Mr. Biester initiated a regular monthly department in the *Qualified Contractor* magazine in which he reported simply and authoritatively on developments in the continuing code-making activity of the Electrical Industry. This provided the means for the important two-way communication between those who represent the industry on code-making bodies and those who work by the code to bring about an ever-increasing degree of electrical safety."

"Mr. Biester's interest in and dedication to electrical code subjects goes back more than 20 years when he was active in local code affairs in Philadelphia. National recognition of his aptitude and interest came approximately 18 years ago when George Andrae, then Chairman of the NECA Codes and Standards Committee, appointed him to four Code Article Committees. Because of his engineering training he served for many years on code committees dealing with cranes and hoists, elevators, welders and machine tools. His technical knowledge make him an especially valuable representative of the Association."

"In 1950 when Mr. Andrae retired as chairman of the Codes and Standards Committee, Mr. Biester was named as Chairman and as personal appointee on the Correlating Committee of the National Fire Protection Association. In that capacity over the past eight years he has given unstintingly of his time and has served with distinction to himself, to his industry and to his fellow contractors. As a further contribution he has advanced the work of the American Standards Association by serving as electrical contractor representative on ASA sectional committees and has contributed to the work of the Industry Committee on Interior Wiring Design which this year was recognized formally as an American Standard."

"With these contributions to the advancement of codes and standards activities in the electrical industry in mind, and recognizing his achievements in his chosen profession, the Committee of Awards has had the honor of unanimously selecting Mr. Biester as recipient of this year's, the second, Coggeshall Award provided in the will of the late Allan Coggeshall to honor the member of the National Electrical Contractors Association adjudged to have made an outstanding contribution to the Electrical Contracting Industry in codes and standards activities."

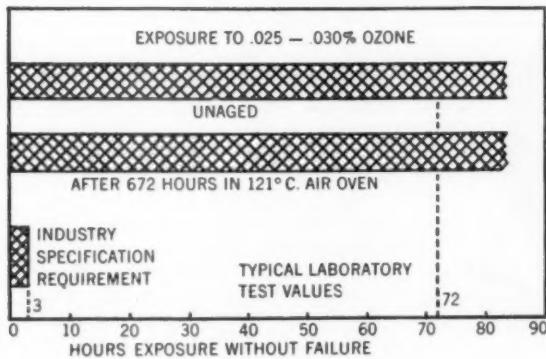
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A year-long analysis of 393 full-length reels of Kaiser Aluminum Kalzone insulated cable showed that more than 93% of the lengths tested exceeded an insulation resistance constant "K" of 100,000... ten times greater than current IPCEA requirements of 10,000!

More than 5% of the balance tested exceeded a 50,000 "K," and $\frac{3}{4}$ of 1% fell between 25,000 and 50,000.

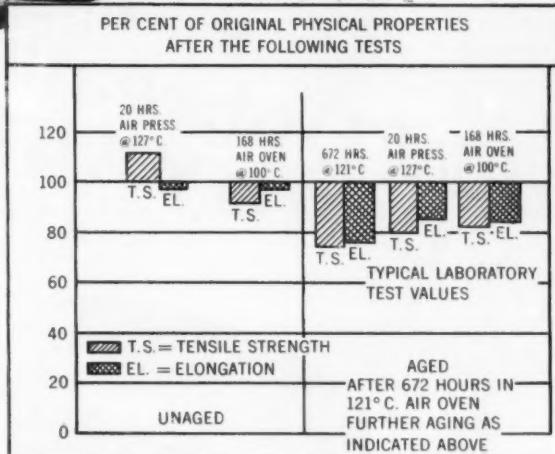
Laboratory tests prove Kalzone provides best protection against ozone, heat, moisture



OZONE RESISTANCE

Unaged—Withstands more than 72 hours in .025-.030% ozone without failure.

Aged—Still withstands more than 72 hours in .025-.030% ozone without failure after 672 hours in a 121°C Air Oven.



HEAT RESISTANCE

Unaged—Practically unaffected by Air Pressure or Air Oven Tests.

Aged—Actually improves in per cent of original tensile strength and elongation in Air Pressure and Air Oven Tests, after 672 hours in 121°C Air Oven.

MOISTURE RESISTANCE

MECHANICAL
Unaged—Less than 5 milligrams absorption in standard Gravimetric 7-day Test. (IPCEA, 15 mgms.)

Aged—After 672 hours in a 121°C Air Oven, less than 7 milligrams absorption.

ELECTRICAL
Unaged—Less than 2% increase in Capacity in 1-14 day EM-60 Test. (IPCEA, 5%).

Aged—After 672 hours in a 121°C Air Oven, less than 1/2 of 1% increase in capacity in 1-14 day EM-60 Test.

Kaiser Aluminum Kalzone insulated high voltage cable is laboratory tested and quality controlled during actual production to assure proved quality with every reel. Get full details on this low cost, lightweight aluminum power cable now. Contact the Kaiser Aluminum sales office listed in your telephone directory.

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DEAD FRONT CAPS
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ONE-PIECE CONNECTORS
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— unbreakable vinyl resists acid, oil, grease . . . can't break under roughest use.



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SAFER, EASIER TO WIRE
— you get clean, safe wiring every time. Handy fast-tag with each device shows simple, easy wiring.



unbreakable vinyl molded-in construction, set new standards for durability, safety and speed of wiring. See for yourself . . . order from your wholesaler or write on company letterhead for a free sample and catalog. Please give wholesaler's name.

PVC ROYALOK is a full line of 2-, 3-, and 4-wire interlocking caps and connectors, 10 and 20 amp., which, because of their unique,



Ralph Cordiner Receives McGraw Award

Ralph J. Cordiner, Chairman of the Board, General Electric Company, received the Manufacturers Medal and Purse, given under the James H. McGraw Award for Electrical Men, at the annual meeting of the National Electrical Manufacturers Association at the Traymore Hotel, Atlantic City, on November 12. E. F. Metz, chairman of the Okonite Company, made the presentation for the Committee of Awards.

The panel of judges who recommended Mr. Cordiner for recognition under the Award consists of: E. E. Helm, Reliance Electric & Engineering Co.; W. H. Burleson, Ohio Brass Co.; S. M. Ford, The Silex Co.; N. J. MacDonald, The Thomas & Betts Co.; and W. T. Stuart, *Electrical Construction and Maintenance*.

Mr. Cordiner was cited for his outstanding personal leadership and continued encouragement and support of the "Live Better . . . Electrically" program which has brought great benefits to the electrical industry and the public it serves. The citation read:

"Ralph J. Cordiner foresaw, in the early 1950's, a growing challenge for the electrical industry. Historical growth patterns showed that the industry was doubling every ten years. It could be expected to double again in a like period but against increasing resistance from a multitude of competing demands upon the consumer's dollar.

"He recognized that a new and integrated sales effort of unprecedented scope was needed to realize the full market potential of the industry and to maintain its historic rate of growth, particularly in the residential market, where modern

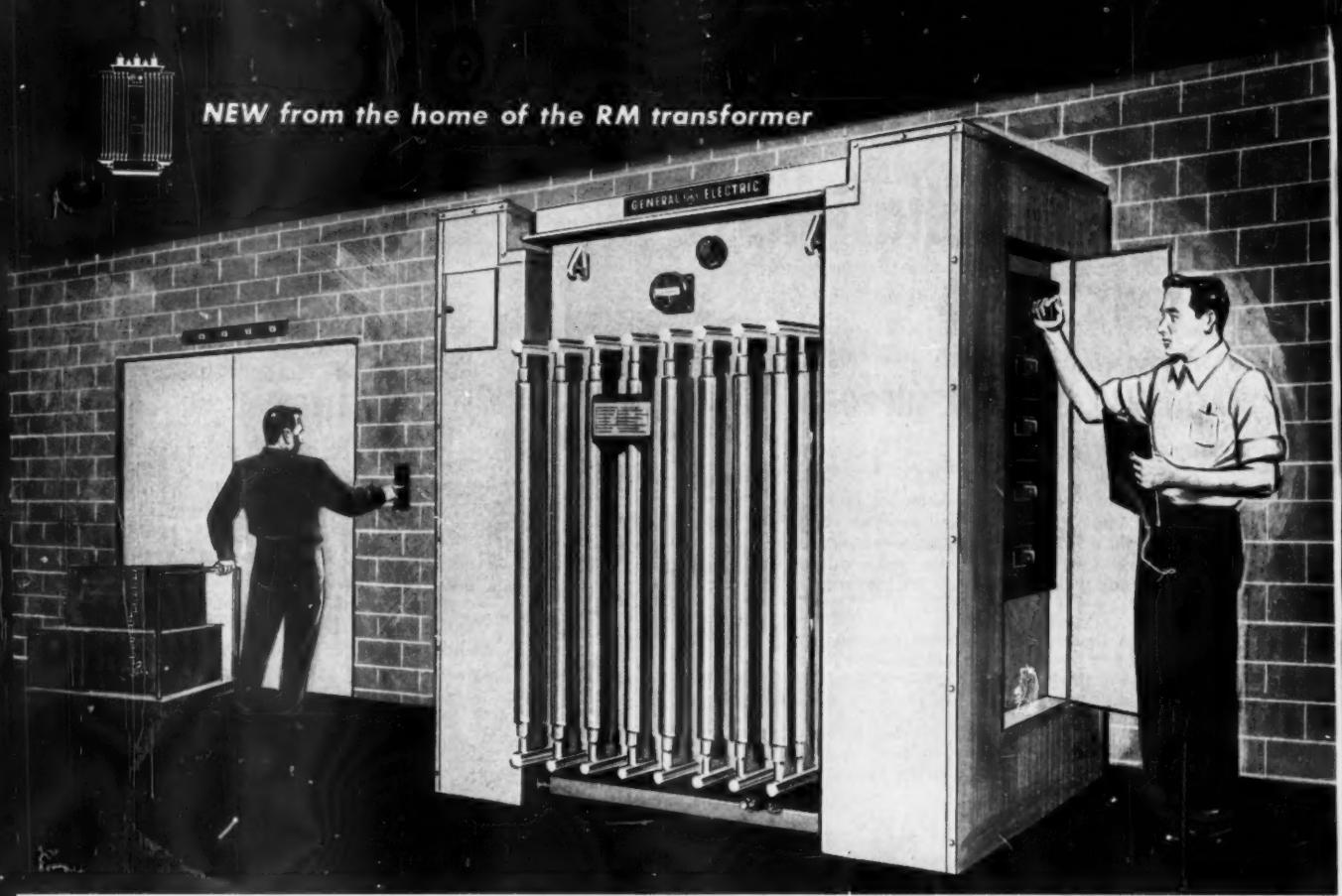
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NEW from the home of the RM transformer



G-E INTEGRAL DISTRIBUTION CENTERS...

Compact, economical power packages

General Electric Integral Distribution Centers are ideal for supplying light power needs in small plants, office buildings, and similar installations.

ECONOMICAL

Integral Distribution Centers are the most economical type substations available. They co-ordinate components in a single, compact package without re-

quiring assembly of expensive panel boards. G-E Integral Distribution Centers are available with open-dry, sealed-dry, or liquid-filled transformers.

EASY INSTALLATION

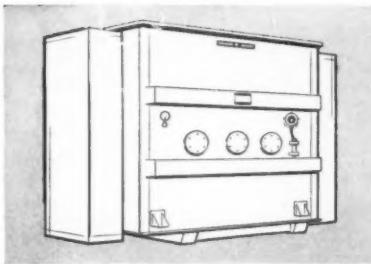
These lightweight units require little floor space, allowing easy installation in any convenient location—balconies, basements, indoors or outdoors.

FULL INDUSTRIAL LINE

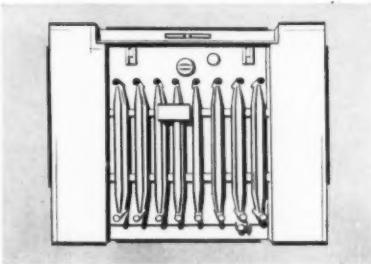
Regardless of your plant's operating conditions, there is an appropriate transformer in General Electric's complete line. Your G-E sales engineer can show you how you can save with faster shipment, easier installation, reduced maintenance, and longer transformer life. General Electric Co., Schenectady 5, N. Y.

427-3

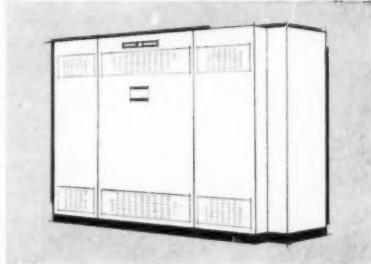
GENERAL  **ELECTRIC**



SEALED DRY-TYPE transformers feature lightweight, long life, broad application.



LIQUID-FILLED transformers feature high impulse strength, broad application.



OPEN DRY-TYPE transformers feature lightweight, small space requirements.

Better installations in less time

Simple, quick to install

BLACKHAWK 540 BOX SUPPORT

stays rigidly in place

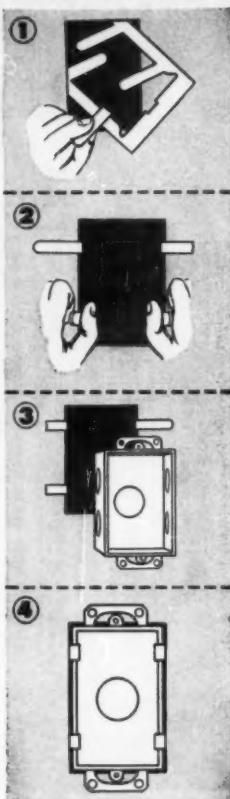
The Blackhawk No. 540 one piece box support slips into the wall opening and tabs are bent back to hold it in place. After the switch box is installed, the tabs are bent to the inside of the box squeezing it firmly in place. It's that simple and quick.

It makes a permanent installation because the Blackhawk 540 box support is a large single piece . . . providing rigid, unified support. It does not wiggle or saw because it is parallel to the wall.

For simple, quick, permanent switch box installation, specify Blackhawk No. 540 box support. Ask your electrical distributor for Blackhawk.



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INDUSTRIES**
DUBUQUE, IOWA



PROFIT from portable job power FOR USE BY YOU ...SALES TO OTHERS

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Compact, hand-carried 1500-watt Universal.



Modern-design, 10 kw., air-cooled, gasoline-powered Universal.



Universal electric plants offer you a double-feature opportunity:

1. Save the time and bother of tapping in utility service. Have convenient, constant power for your residential and commercial work with a portable Universal. Low-cost models for all power tool and lighting needs.
2. Add Universal to your equipment line for extra profits. Supply the growing demand for portable and stand-by emergency power—to homeowners, hospitals, public buildings, construction contractors, etc. Universal is the full-range line with both gas and diesel series, air- and water-cooled from 250 watts to 35 kw. All types of controls.

SEE for yourself how the big, versatile Universal line can set you up for greater job efficiency and outside business. Write for this complete line bulletin of pictures, specs and information. It's Bulletin BE-6.

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Universal Drive, Oshkosh, Wisconsin

electrical utilization can contribute so beneficially to the comfort, convenience and enrichment of the home environment.

"He saw the urgent need for a sustained market development program of major size which could enlist the combined efforts of the entire electrical industry. But as late as 1955, there was no integrated industry approach to the development of the residential market, nor was there an industry-wide organization prepared to do the job.

"Action was needed and quickly. Mr. Cordiner brought the full resources of his own company behind a new and bold program, "Live Better . . . Electrically", a broad promotional effort without company identification and developed to encourage the active and enthusiastic cooperation, participation and endorsement of all electrical manufacturers, utilities and key industry groups.

"Industry acceptance was prompt and enthusiastic. Endorsement and participation broadened until the program objectives are now supported by the combined efforts of more than 200 utilities, 180 electrical manufacturers, and many trade associations and industry journals.

"For his outstanding personal leadership and continued encouragement and support of the "Live Better . . . Electrically" program which has brought great benefits to the electrical industry and the public it serves, the Committee of Awards upon the recommendation of the Committee of Judges awards to Ralph J. Cordiner the 1958 Manufacturers Medal and Purse given under the James H. McGraw Award for Electrical Men."



BUSY CHECKING job plans are (L to R) G. X. Travis, executive vice president, and R. C. Fuller, estimator-engineer, Square Deal Electrical Contracting, Inc., LaPorte, Indiana. Firm runs the construction gamut from residential and line work through commercial and industrial installations.

CONTRACTORS "DISCOVER" ALCOA CONDUIT

Lower cost, installation economies, corrosion resistance make Alcoa Aluminum the best conduit buy

An increasing number of cost-conscious contractors are switching to aluminum rigid conduit for office buildings, industrial plants and other new and remodeled structures. Here are some of the reasons why:

- Lower prices plus light weight and ease in handling make Alcoa Aluminum Conduit installations competitive.
- Corrosion resistance of aluminum means less maintenance, freedom from staining.
- Aluminum is easier to cut, bend and thread. Wire pulling is easy, too, because of specially treated internal surface.
- Nonmagnetic aluminum offers up to 20 per cent less voltage drop.

• Clean, modern appearance complements modern architecture.

• Aluminum is nonsparking and has Underwriters' Laboratories, Inc., approval.

Find out why Alcoa® Aluminum is your best conduit buy. Contact your electrical distributor, or write Aluminum Company of America, 2327-M Alcoa Building, Pittsburgh 19, Pennsylvania.

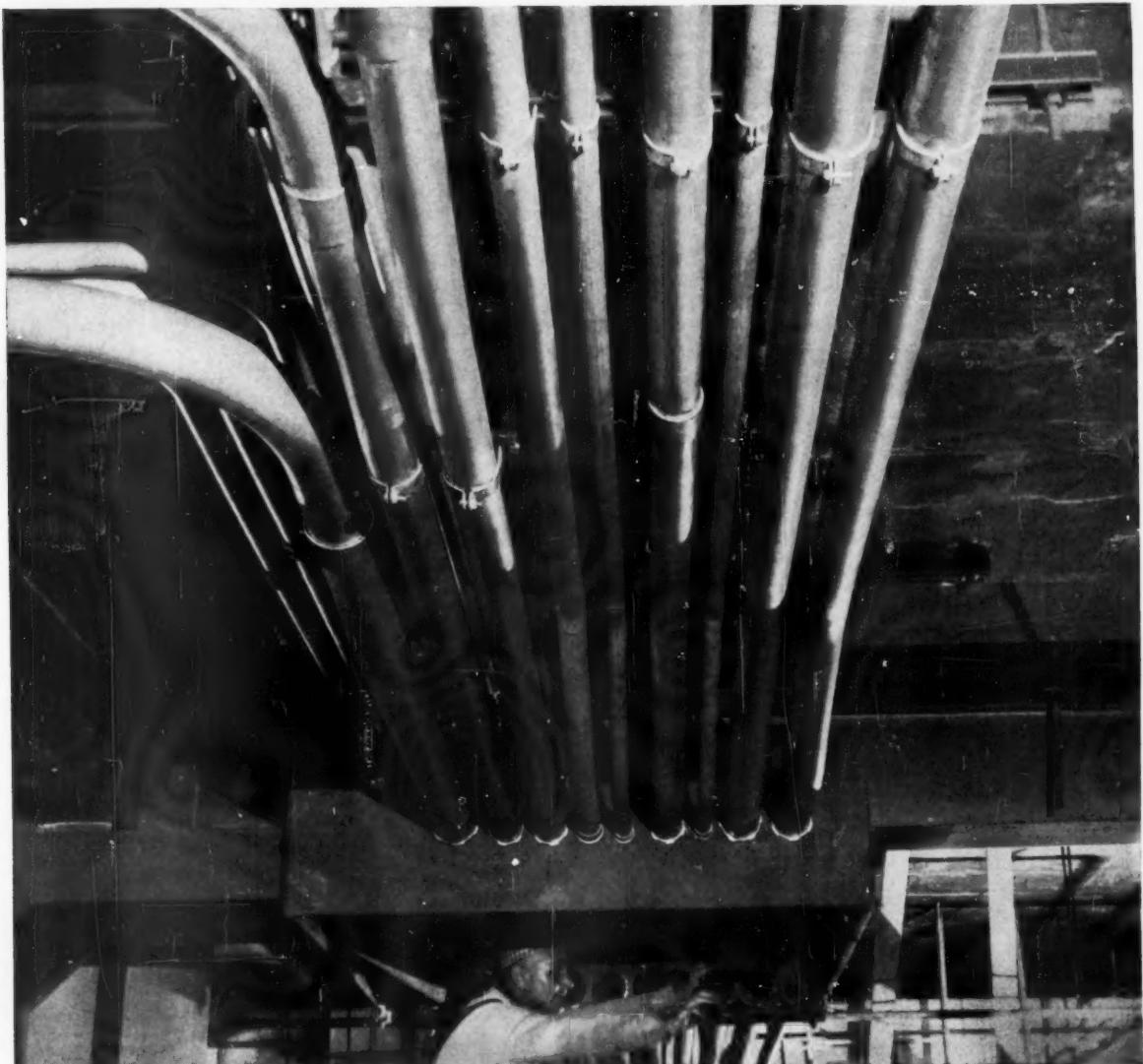


Your Guide to the Best
in Aluminum Value



ALCOA THEATRE
Fine Entertainment
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Fenn College, Cleveland, Ohio



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design
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45W wall mounted edge-lit



**cast aluminum
quality**

mc Philben's 45 line edge-lit directionals are designed to blend with the finest contemporary decor in hotel lobbies, auditoriums, office buildings, schools and other public locations.

Gleaming satin finish . . . solid cast aluminum construction . . . wall, ceiling or surface mountings . . . incandescent and fluorescent models . . . invisibly hinged access doors . . . flush fasteners . . . acrylic Plexiglass inscription panels illuminating full length of letter . . . these are some of the features making mc Philben's 45 line edge-lit directionals the architect's first choice for use in the nation's finest buildings.

The 45 line series is available with either "exit" or special wording inscriptions. 4½", 6" or 8" lettering with red, green and white color combinations conform with all local regulations.

Contact your mc Philben representative today for full details. See our insert in Sweet's file # or write for data sheet E-1.

mc Philben
LIGHTING COMPANY

1329 Willoughby Avenue
Brooklyn 37, New York

Maintenance Co. Moves To Long Island City

The Maintenance Co., Inc., and affiliated MAINCO companies, moved on November 3 from the company's 6-story building on West 42d St., Manhattan, to its new, modern plant at 10-40 45th Ave., Long Island City. The company is said to be the oldest and largest independent electrical and mechanical maintenance contracting company specializing in the installation, maintenance and modernization of building elevators, air conditioning, electrical plant equipment, and wiring for light and power.

William J. Wheeler, Sr., president, cites as reasons for relocating the company, its need for increased floor space to accommodate its offices, service shops and stock rooms, plus a location that is free from traffic congestion.

NISA News

More than 50 officers, mostly presidents, of NISA chapters in the United States and Canada, and members of the association's chapter affairs committee convened in St. Louis on October 24 and 25 at the Hotel Statler for the first annual Chapter Officers Conference.

The leaders of the independent service industry spent a day and a half discussing mutual problems and making recommendations on national policy. J. Arthur Turner Jr. of Tampa (Florida) Armature Works, chairman of the chapter affairs committee of NISA and national secretary, presided, assisted by national president Paul M. Sievert and executive vice-president Joseph M. Harrington.

The association's national board of directors met in Cleveland at Hotel Cleveland November 14-15 for its annual mid-year meeting.

Connecticut Chapter held a general business meeting at Weather-vane Restaurant, Stamford, on October 2.

Clarence S. Moran, owner of Standard Electric Motor Works, Detroit, Mich., and George S. Larsen, partner, Larsen-Hogue Electric Co., Los Angeles, Calif., were elected to the NISA board of directors for three-year terms last month. They will take office at the directors' meeting in Montreal, Quebec, next May 17-20 during the

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Something
MORE INTERESTING
THAN ...**

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5 lines to
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**...with CONDUFLOR
21 pair cable terminal**

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QUAD EASY-TACH is an entirely different, simple to wire, terminal base and detachable reflector lamp holder assembly. The hood has an exclusive spring-action that permits easy, fool-proof, snap-on and snap-off of any QUAD socket type reflector.

It is mechanically designed so that the socket makes positive electrical contact with balanced pressure. Its switch-like action prevents electrical arcing and re-lighting when servicing or interchanging reflectors.

EASY-TACH disconnect sockets fit nine different standard QUAD reflector designs. Five are RLM designs. EASY-TACH units are available with mogul or medium sockets through leading electrical distributors everywhere. For further details, contact the QUAD representative nearest you or mail coupon today!



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INCANDESCENT RLM LINE

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REFLECTORS ALL WHITE OR GREEN OUTSIDE

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Please send me details on QUAD EASY-TACH.

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DRILL CONCRETE in SECONDS

Not Minutes Not Hours

The Penndrill Model "E" is a complete drilling unit, easily operated by one man and drills holes from 1 to 14 inches in diameter up to 19 inches deep.

Requires no set up time and presents no problems for drilling holes close to walls or in corners—one man can carry it up stairs.

Using diamond bits, it drills neat, clean holes vertically, horizontally or at any angle in concrete, asphalt, marble, granite, including any pipe, conduit, steel, etc. that might be encountered in the drilling.

PENNSYLVANIA DRILLING COMPANY

Masonry Drill Division

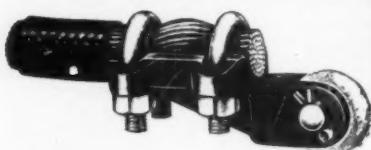
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"EFFICIENCY" Cable Strain Clamp

WITHOUT DAMAGE TO CABLE



... WITHSTANDS
DIRECT PULL OF 17,000 POUNDS

Efficiency Cable Strain Clamps lock cable safely and securely without possible strain or damage. "H" construction of clamps and high ridge across center of cable prevents cable from slipping. Takes cable from 1/0 to 1,500,000 c.m. Three clamp sizes cover all cable sizes. Furnished with eye or clevis, for AC or DC service.

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ELECTRIC & MFG. CO.
EAST PALESTINE, OHIO

RIGID Conduit PIPE COUPLINGS



IN STOCK

1/2" to 6" sizes

BLACK ENAMELED —
HOT DIP GALVANIZED

CONDUIT NIPPLE MFG. CO.

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BRAINSTORMING the International Convention of NISA, to be held May 17-20, 1959 at Hotel Queen Elizabeth, Montreal, are members of the convention committee shown here at a meeting July 31. Seated, from left: Cliff Ainsworth, Ainsworth Electric, Toronto, Ont.; D.D. Bishop, Montreal Armature Works, John Clermont, Leduc Electrical, Ltd., and Paul Barbeau, Montreal Armature Works, all of Montreal; and Hector Robege, H. Robege, Inc., Quebec. Standing are Joseph M. Harrington, NISA executive vice-president, and H. C. Blenkhorn, of Blenkhorn & Sawle, Ltd., St. Catharines, Ont.

International Convention of NISA. They attended the mid-year meeting on November 14-15.

Re-elected to second three-year terms were J. Arthur Turner Jr., of Tampa (Florida) Armature Works; Thomas M. Paul, of Paul Electric Co., Sioux City, Iowa; and Alex A. Shovan, Industrial Electric Service Co., Hawthorne, N. J.

The new warehouse and shop of the J. E. Berger Corp. of Detroit was the site of the October 20 meeting of Great Lakes Chapter. More than 180 attended, one of the largest crowds in association history.

Germantown, Wis. was the location of the October 20 meeting of that state's chapter. The Dow Corning Corp. film, "Building Rewind Business" was the feature event of the evening.

George T. Kinard of Beaumont, Texas, and James A. Phares of Oklahoma City were elected to one-year terms as first and second vice president respectively by members of Southwestern Chapter at the group's meeting in Tulsa, Okla. in September. James Morgan was re-elected secretary-treasurer. V. A. (Dick) Bradley's term as president expires in 1960.

Directors of the Southwestern Chapter, also elected at the recent Tulsa meeting, are: Charles Hen-

drickson, Duncan, Okla.; J. B. Johnson, Tyler, Texas; Paul Jones, Hobbs, N. M.; O. H. Caldwell, Waco, Texas; H. F. Champion, Amarillo, Texas; Bill Lewis, Harlingen, Texas; C. R. Hamilton, Austin, Texas; H. P. Woolley, Houston; G. W. Botten-field, Tulsa, Okla.; W. J. Bowers, Mesa, Ariz.

A post-meeting trip to Monterrey, Mexico, will take place after the spring conference of Southwestern Chapter in Brownsville, Texas, at El Jardin Hotel on March 19-21. The chapter's fall meeting will be held in Houston.

Gerry Schaefer of C. I. Schaefer Electric Co., St. Louis, was elected president of Greater St. Louis Chapter at the organization's meeting on November 5 at Edwardsville Gun Club.

Arthur C. Roe, former Westinghouse engineer and textbook author who recently joined the NISA engineering department, has made appearances as guest speaker at NISA meetings in Nashville, New York, Detroit and St. Louis. Mr. Roe and C. H. Lankford, a staff engineer, are preparing a section for the NISA technical manual on glass banding as the first of several major projects to be undertaken by the association in the coming months.

Puget Sound Chapter met at Hotel Benjamin Franklin in Seattle on November 4 to hear president Harry Brown report on the St. Louis Chapter Officers' Conference.

Louis Freund

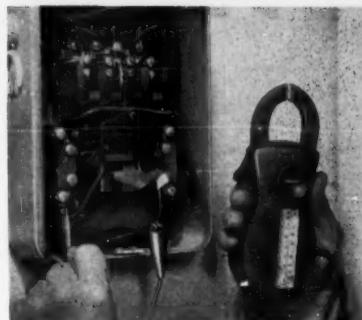
Louis Freund, New York City, died November 12 of a cerebral hemorrhage. He was 80 years old.

Although he retired in 1952 as head of Louis Freund, Inc., after 49 years in the business, Mr. Freund continued his activities in electrical organizations. In 1957 he was elected historian of the New York Electrical Contractors Association.

He was a charter member of the Electrical Board of Trade and was chairman of the apprenticeship committee of the Joint Industry Board of the Electrical Industry. He had been president of the New York State Association of Electrical Contractors and Dealers and of the Independent Electrical Contractors Association, Inc. He also was a member of the board of governors of the National Electrical Contractors Association.

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test needs
with the

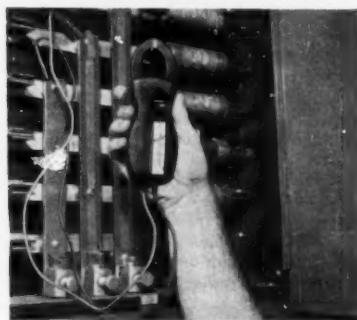
ALL-PURPOSE AMPROBE RS-3



Check resistance of
motor control solenoid coil.



Use as continuity tester
to determine if fuse is good.



Check for low voltage condition.

Meets every commercial voltage requirement on three voltage scales . . . 0-150/300/600 volts ac. Accurate current readings from 0 to 300 amps on five current ranges. The ohmmeter scale is designed specifically for you . . . readings as low as 0.5 ohms can be taken, enabling you to readily distinguish the difference between short circuits and actual coil resistances.

AMPROBE RS-3

Pyramid Instrument Corporation, Lynbrook, N. Y.

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INSTALL YOUR "FIELD"
WIRE ASSEMBLIES FASTER,
BETTER, MORE
ECONOMICALLY WITH THE

Insuloid cradleclip

TRADEMARK

WIRING SYSTEM



Insuloid "Cradleclips," consisting of a series of Nylon Cradles and Neoprene Clips for anchored wiring and Nylon Binders and Neoprene Clips for unsupported wiring, provide a wiring system that offers all of the following advantages . . . fast, takes but 5 seconds per fixing point . . . efficient, "Cradleclips" hold cables securely "in place" without cable damage . . . compact and neat in appearance . . . easy to use under all weather conditions . . . holds cables away from panel walls for greater ventilation . . . economical, the use of "Cradleclips" may be reopened and closed as often as you like — provide a fast, easy method to make wiring changes.

The "CRADLECLIP" WIRING SYSTEM



Nylon Cradles and Neoprene Extensible Clips for Anchored Wiring.

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FREE SAMPLE KIT and Technical Information sent on request. Write today for yours, there is no obligation of course.

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DATES AHEAD

Industrial Heating Equipment Assn.—

Annual winter meeting, Hotel Cleveland, Cleveland, Ohio, January 19-20.

Power & Communications Contractors Assn. — Shamrock Hilton Hotel, Houston, Texas, January 25-27.

Plant Maintenance & Engineering Show — Public Auditorium, Cleveland, Ohio, January 26-29.

14th International Heating & Air Conditioning Exposition — Commercial Museum & Convention Hall, Philadelphia, Pa., January 26-29.

American Institute of Electrical Engineers — Winter general meeting, Hotel Statler, New York, N. Y., February 1-6.

Home Improvement Products Show — Coliseum, New York, N. Y., February 4-6.

National Electrical Week — An all-industry event, February 8-14.

Electric Associates, Inc. — National Electrical Week luncheon, Sheraton-Astor Hotel, New York, N. Y., February 10.

National Rural Electric Co-op Assn. — National Guard Armory, Washington, D. C., February 9-12.

2nd Biennial Electrical Trade Conference & Exposition — Sponsored by Electrical Trade Institute of Washington, Sheraton Park Hotel, Washington, D. C., February 17-18.

Upper Midwest Electrical Industry Convention — Leamington Hotel, Minneapolis, Minn., February 22-25.

15th Annual National Wiring Sales Conference — Jung Hotel, New Orleans, La., February 26-27.

2nd National Lighting Exposition — Coliseum, New York, N. Y., March 1-4.

Industrial Electrical Exposition — Sponsored by Essex Electrical League, Olympic Park, Newark, N. J., Week of March 2d.

Edison Electric Institute — Annual sales conference, Edgewater Beach Hotel, Chicago, Ill., March 8-12.

American Power Conference — Sponsored by Illinois Institute of Technology in cooperation with some 14 colleges and universities and 10 engineering and technical societies. Hotel Sherman, Chicago, March 31 and April 1-2.

Edison Electric Institute — Annual Convention, New Orleans, La., April 5-9.

Progress in Electrical Equipment — Kiel Auditorium, St. Louis, Mo., April 7-9.

National Association of Lighting Maintenance Contractors — Annual conference, Cosmopolitan Hotel, Denver, Colo., April 27-29.

National Industrial Service Assn. — Queen Elizabeth Hotel, Montreal, Canada, May 17-21.

National Fire Protection Assn. — Annual meeting, Atlantic City, N. J., May 25-29.

National Association of Electrical Distributors — 51st annual convention, Conrad Hilton Hotel, Chicago, Ill., May 24-29.

New York State Association of Electrical Contractors and Dealers — 60th Annual convention, Whiteface Inn, Lake Placid, N. Y., July 7-10.

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for all types of installations

Single stroke or vibrating

in all voltages — DC 6 to 220 v. AC 6 to 250 v.

in sizes from 3" to 12"



For all telephone or alarm systems. Housings of sturdy cast aluminum with excellent clarity and high decibel output. Underwriters Laboratories listed. Also a full line of cow bells and buzzers.

 Write for literature
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TELEPHONE CO., INC.

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*Best for
Insulation Test!*

**"MINOR"
MEGOHMER**

SMALL SIZE
LOW PRICE



DEEP CASE
EASY CRANKING

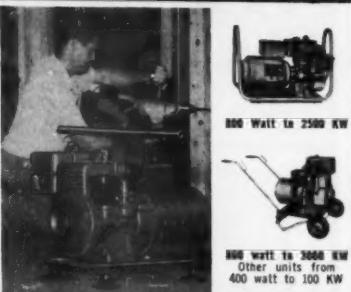
with 500 VOLT DC GENERATOR

Range 0-50 Megohms; weight 3 lbs. True Ohmmeter, independent of generator speed. Complete with genuine leather carrying case, 6 ft. test leads, 50 Megographs.

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HERMAN H. STICHT CO., INC.
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PORTABLE POWER CUTS YOUR COSTS



800 WATT TO 2500 KW

800 WATT TO 2500 KW
Other units from
400 watt to 100 KW

USE POWER TOOLS WITH DEPENDABLE

WINPOWER ELECTRIC PLANTS

You save 3 big ways with a WINPOWER electric plant:

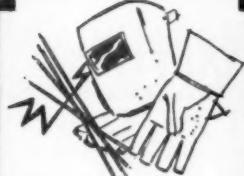
- (1) costs less to buy . . . priced to beat all competition;
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BRUSHES

Get maximum generator efficiency . . . protect electrical equipment with HELWIG BRUSHES that offer better commutation, longer brush life. Equal in quality and specs as original equipment. Stock available for immediate delivery — anywhere. Depend on HELWIG for speedy "RED CARPET" Service. Write for new catalog No. 87.

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RUSH BRUSH SERVICE.

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CARBON
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Among the Manufacturers

Headquarters Announcements

Kennecott Copper Corp., New York, has purchased properties and assets of the Okonite Company, Passaic, N. J. Okonite will operate as a subsidiary.

Howard Industries, Inc., Racine, Wis., has purchased McGraw-Edison Company's complete line of precision-type motors.

Robertshaw-Fulton Controls Co., Milford, Conn.—Louis J. Casillo, production manager, Bridgeport Thermostat Div.

Delta-Star Electric Div., H. K. Porter Co., Chicago, Ill.—R. W. Dixon, manager, C. R. Billman, assistant manager, Electric Service Works, Philadelphia; H. Yale Mageoch, director of engineering and research, Allan K. Alsaker, chief engineer, at Chicago headquarters.

Pittsburgh Standard Conduit Co., Pittsburgh, Pa.—A. J. Zoth, secretary.

General Electric Co., Plainville, Conn.—Richard W. Morefield, manager, merchandise sales.

Quadrangle Mfg. Co., Chicago, Ill.—Joseph A. Schneller, manager, sales and marketing.

Ramset Fastening System, New York—R. H. Benedict, Jr., field sales manager; A. T. Masters, manager of product evaluation.

Rawlplug Co. Inc., New Rochelle, N. Y.—Allerton J. McEwan, vice president, sales.

Rome Cable Corp., Rome, N. Y.—Albert W. Dudreck, advertising and sales promotion manager.

Ainsworth Lighting Inc., Long Island City, N. Y.—Freedom H. Ainsworth, president; George L. Green, executive vice president; Robert Greenlee, Jr., member of the board of directors.

Controls Co. of America, Schiller Park, Ill.—Jack Searls, manager of field sales, heating and air conditioning controls.

Conduit Fittings Corp., Chicago, Ill.—Kenneth S. Weiss, assistant sales manager.

Federal Pacific Electric Co., Newark, N. J.—Robert L. Bobo, vice president, marketing; Harry E. Knudson, Jr., general sales manager.

Lustra Corp., New York—S. Byron Stone, advertising manager, lighting and specialty products.

Tensolite Insulated Wire Co., Tarrytown, N. Y.—George W. Heller, vice president for technical service and sales.

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ETP

fittings

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Chromate Plated
FOR LASTING
PERMANENCE!



...AT NO INCREASE IN PRICE!

Concrete tight! Every size connector and coupling up to 2". Why settle for ordinary fittings when ETP gives you all this:

- New sparkling Zinc Chromate overplating for lasting permanence. Salt spray tested to retard corrosion.
- Exclusive pre-set, deep-slotted STAKED screws. No backing out for conduit.
- Concrete tight with heaviest gauge wall thickness. U.L. file card E24788.
- Precision bevelled edges with extra heavy duty locknut.
- One piece solid tubular steel—cannot open or spread. Sized for uniformity.
- Available in $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1", $1\frac{1}{4}$ " (one screw type) and $1\frac{1}{2}$ " and 2" (two screw type)

CONNECT WITH **ETP** FOR ECONOMY

ETP


ELECTRIC TUBE PRODUCTS

74-16 Grand Avenue, Maspeth (N.Y.C.), N. Y.

Two New Mineralac Quality Products
Designed for Jobs Too Heavy for
Standard Jiffy Clips

MINERALLAC Heavy Duty AND Medium JIFFY CLIPS



THIS INVERTED RIB
DOES THE JOB

Also
available
without
mounting
hole for
use with gun.

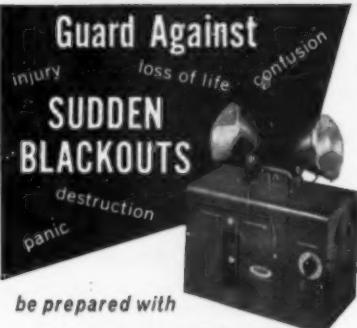
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General Electric Co.: John R. Casey, manager of user industries sales for New England, Apparatus Sales Div.

MIDDLE ATLANTIC

Pass & Seymour, Inc.: John G. Applegate, Jr., sales representative in the Philadelphia territory.

Pittsburgh Standard Conduit Co.: James D. Logan, eastern regional sales manager, Philadelphia - Baltimore - Washington district; William A. Touhey, sales representative covering Pennsylvania and southern New Jersey.

Chester Cable Corp.: Martin P. Andrews Co., sales agent in Upstate New York; Cooper Simon Co., Inc., agent for Northern New Jersey and Southern New York; J. Keefe Jr., agent for South Jersey, Eastern Pennsylvania, Delaware, Maryland, and the District of Columbia.

Allis-Chalmers Mfg. Co.: Donald C. Burk, sales representative to the Philadelphia district.

Sylvania Lighting Products: H. Page Woodbury, Pittsburgh district sales manager; Carl M. Long, Buffalo district sales manager.

Pass & Seymour, Inc.: Richard Shapleigh, sales representative, Westchester District, New York.

SOUTH ATLANTIC

Chester Cable Corp.: C. G. Coppage, Winter Park, Fla., sales representative for state of Florida.

Arrow-Hart & Hegeman Electric Co.: Patrick M. Burgoyne, sales representative in North Carolina, Virginia and Eastern Tennessee.

Pittsburgh Standard Conduit Co.: Gerald L. Cronan, Baltimore, sales representative for Baltimore-Washington area.

EAST CENTRAL

I-T-E Circuit Breaker Co.: John C. Swander, district manager, new Davenport, Ohio, office.

Allis-Chalmers Manufacturing Co.: Thomas E. Hintzman, sales representative to Chicago district.

Standard Transformer Co.: Dale P. Seyfried Co., Detroit. Representatives in Detroit and eastern Michigan; Stout Electrical Sales Co., Cincinnati, representative in Cincinnati, southern Ohio and southern West Virginia.

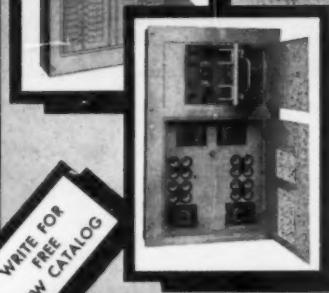
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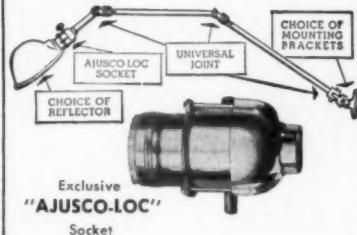
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Chester Cable Corp.: Edward Hoffman, St. Paul, sales agent in Minnesota and eastern Dakotas.

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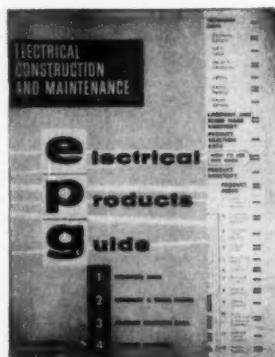
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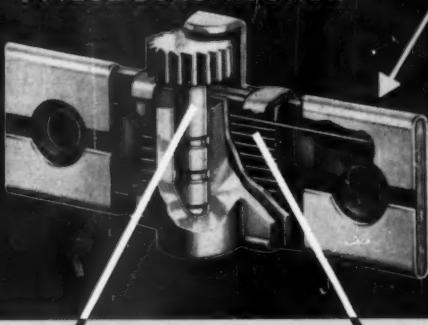
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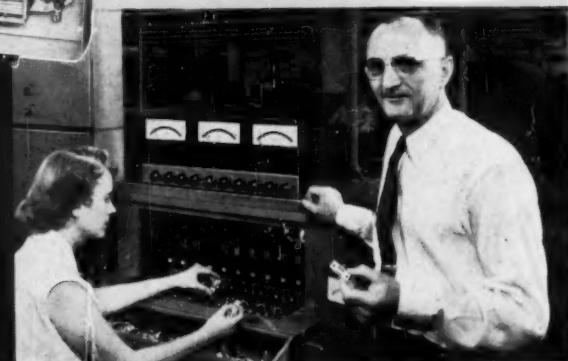
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